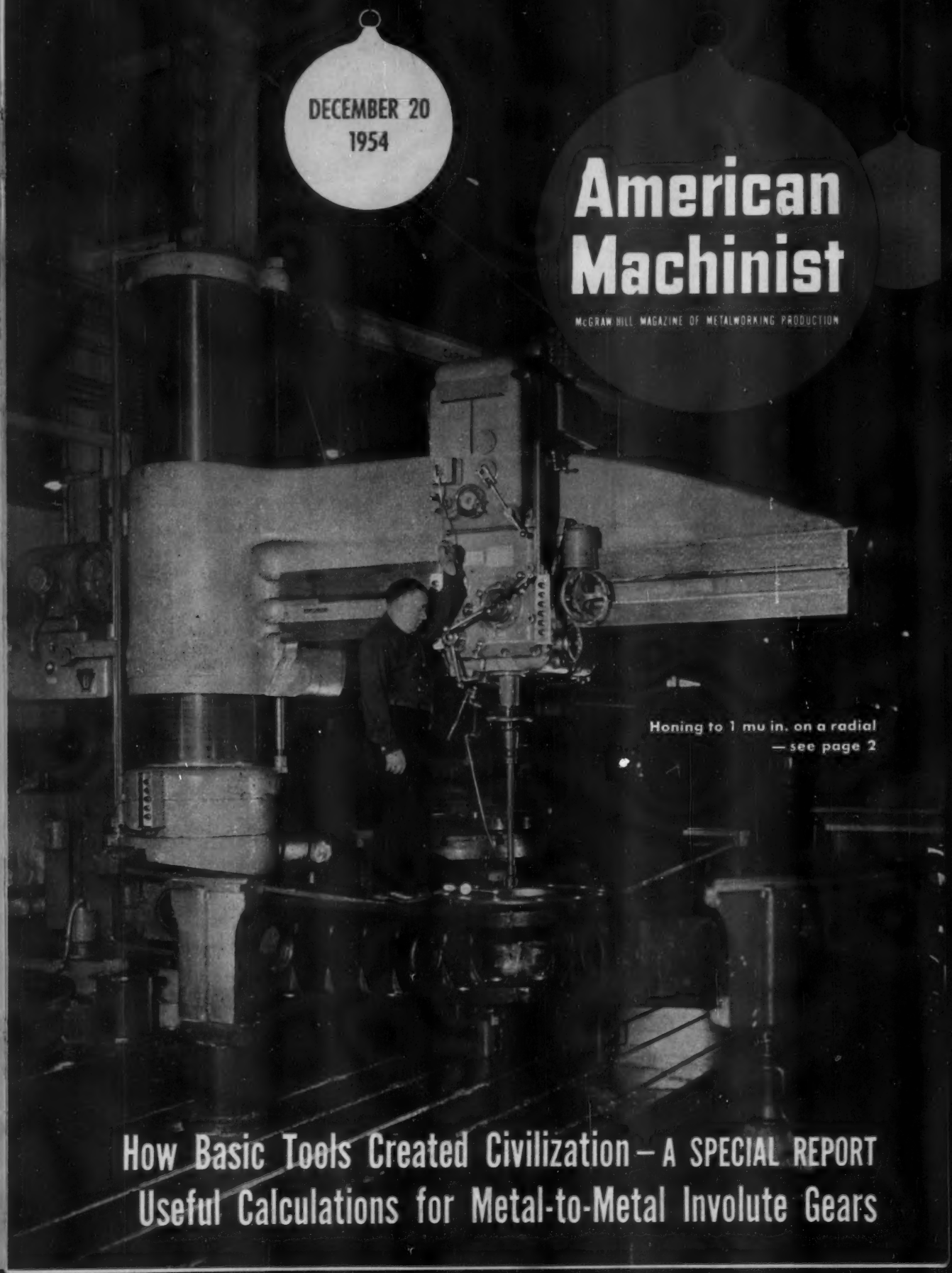
PRICE 50 CENTS

DECEMBER 20
1954

American Machinist

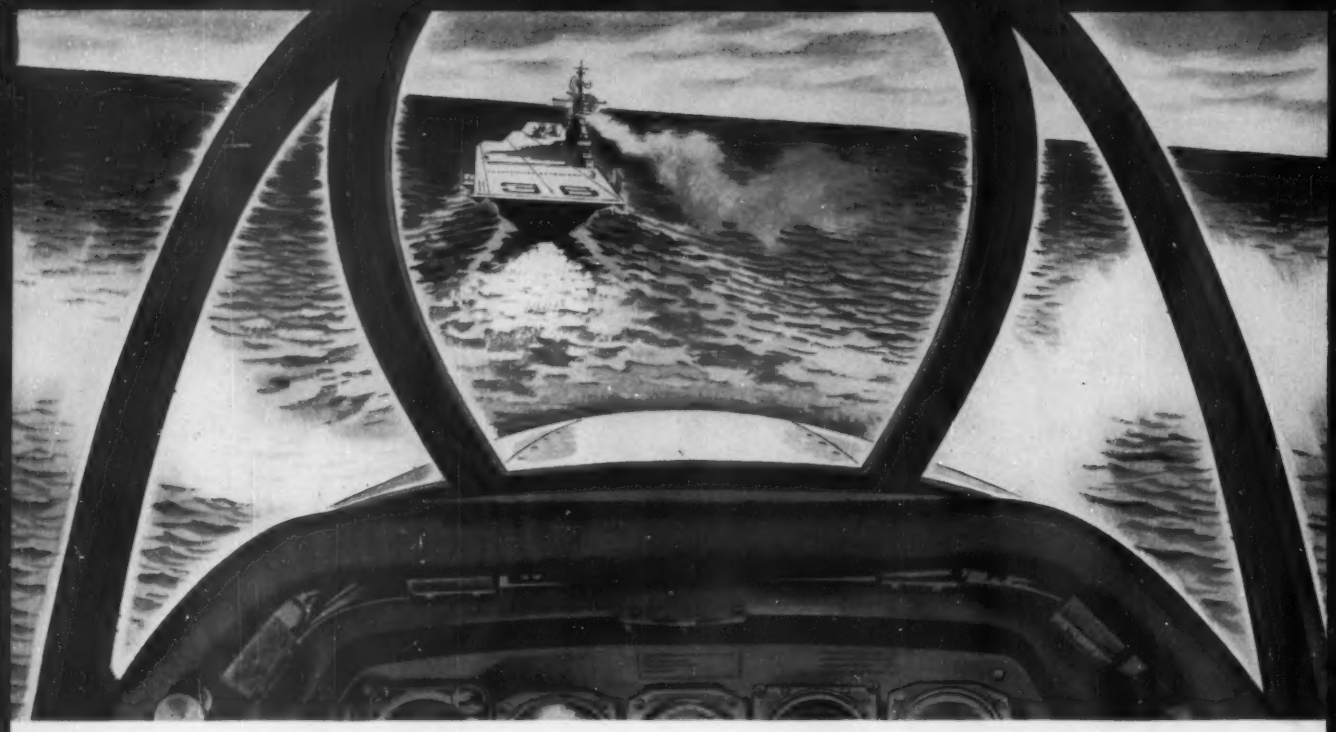
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



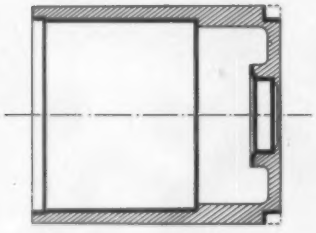
Honing to 1 mu in. on a radial
— see page 2

How Basic Tools Created Civilization — A SPECIAL REPORT

Useful Calculations for Metal-to-Metal Involute Gears



HOME TO A NEEDLE IN A HAYSTACK



. . . a little sooner, a little surer because navigation instrument parts like this were BORIZED*

This model 122 Heald Bore-Matic bores, plunge faces, turns and chamfers six different end bells for a manufacturer of precision aircraft instruments.

Double end machine finishes both ends of part in sequence in a high-speed automatic cycle. After work is loaded in air-operated chuck, table traverses left to bore and plunge face one end of part, then reverses right to perform similar operations on the opposite end. Turning operations, when required, are performed in a similar cycle.

WAR OR PEACE, preparedness is a twenty-four-hour job. If you're a carrier pilot, that flight deck looks mighty good after you've been out on a long mission. To find it, on a limitless expanse of ocean, calls for some pretty precise navigation.

That's why the highest standards of accuracy and precision are rigidly maintained in every step of aircraft instrument manufacture—military or civilian. Heald borizing of the instrument end bells, as shown here, assures consistent, uniform production that's well within specified tolerances.

Whenever a part is precision finished on a Heald Internal, Rotary Surface Grinder or Bore-Matic, you can be sure of three things. A longer-lasting precision-made part. Substantial savings in time and production cost. And a definite competitive advantage for your product.

IT PAYS TO COME TO HEALD!

Precision finished by a Heald engineered method on a Heald Bore-Matic.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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NUMBER OF COPIES PRINTED THIS ISSUE 37,882

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Donald C McGraw, President; Willard Chevalier, Executive Vice President; Joseph A Gerardi, Vice President, Treasurer; John J Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Nelson Bond, Vice President, Director of Advertising; J E Blackburn Jr, Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, N.Y. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Reentered as second-class matter November 17, 1953, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

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ABC ABP

chips

HONING RADIAL . . . Westinghouse has installed at East Pittsburgh the 5A Carlton radial shown on our cover to do honing as well as conventional drilling. Drill jigs, miscellaneous items and the spiders in the picture are worked, usual hole range being 2 to 5 in. in dia. Either blind or through holes may be honed with this new Carlton attachment, to finishes within 1 mu in. and with a stroke of 5 to 24 in. On this job, diameters are held to 0.0002-in. tolerance, finish to 12 to 15 mu in. Coolant for the hone is held in a separate tank, and one set of stones averages a dozen holes. Previously, holes were drilled, bored to size, then reamed and lapped—a delicate operation frequently resulting in holes non-uniform in size. Now all holes are honed to match the largest, lapped first to establish base size.

GEAR CALCULATIONS . . . Oliver Saari of Illinois Tool Works is with us again, this time presenting useful calculations for metal-to-metal involute gears. Relation of tooth thickness and center distance are vital in gears to operate without backlash (gears rolled with masters and in gear shaving). Mr Saari provides formulas for four cases: spur (1) and helical (2) gears rolling on parallel axes, helical gears rolling on skew axes with base helix angles equal (3) or unequal (4).

SYNCHROMATION . . . Associate Editor Brosheer has studied a special Gisholt setup, comes up with a story showing a fairly simple method for synchronizing output of two or more machine tools.

SPOTWELDING TI . . . Some months ago, we discovered that University of Texas had done some significant research on spotwelding titanium. We got Professors Begeman and McBee to give us a report.

CONTRAST . . . Now that both heat and humidity are over for this year, we can view their effects objectively. Ann Stresau of Allis-Chalmers gives you results of a study she made of the effect of weather on shop accidents. Contrary to popular opinion, the effect is nil.

PRESENT . . . Several months ago, we discussed with Leighton Wilkie some research his Wilkie Foundation had done which resulted in a unique traveling exhibit (*AM*—Nov 22). We felt that the summary chart and theme would interest you, because they show our civilization is based on the tools you make and use. So we prevailed upon Mr Wilkie to allow us to reproduce some of the material. You'll have to fight your children to keep this Christmas present.

COMING . . . *AM* starts its New Year Jan 3 with an issue full of new ideas. The Special Report describes the Buick automated pinion line, with many problems solved in handling a 1-in.-OD x 5/8-in. long, helical-toothed gear. There's a lead article showing how dies are engraved, hubbed and etched, with a second story describing just how the little-known process of etching is done. Then there are other articles on locating links, on selection of broaches for burnishing (another Soviet translation), on pipe bending, index feeding, electroless plating, and on plastic gears. The cover pictures a jig grinder.

Leighton A Wilkie was born in Winona, Minn, 48 years ago and went to high school there, then to the University of Minn schools of ME and Business Administration. He is the inventor of the DoALL band machine and other products. With his brothers, Robert and James, he founded and operates the DoALL organization, which produces 80 products in 5 plants and distributes 1500 through 40 of its own retail stores. He is chairman of the board of his company and of the Wilkie Foundation, a non-profit organization devoted to research into scientific and economic phenomena. He directed research and gathering of specimens which resulted in our current Special Report, and its ancestor, the touring "Civilization through Tools" exhibit.

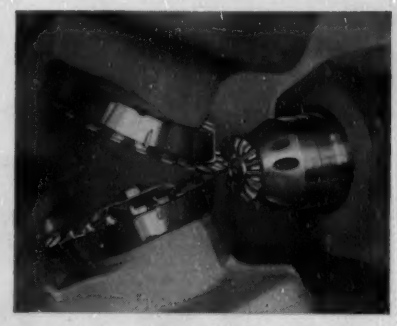
A complete gear for a fifth of a gear!

It all depends on the gear, of course. But, by the time an earlier model generator has cut one-fifth of a gear, the new No. 104 Straight Bevel Coniflex* Generator has *completed* a similar gear!

You can increase your production by as much as 500% with this new Gleason machine. You can get these results because this generator has two interlocking disc-type cutters with twenty-four blades each. These cutters complete a gear in *one rapid operation!*

But that is not all. The No. 104 is easy to set up—it has a wide range of capacity—it is excellent for small quantities or volume production. And, a new generating method insures high efficiency, fine finish, and maximum cutter life.

Write us and we will be pleased to send you a bulletin and further information on the new No. 104 Straight Bevel Coniflex Generator.



The No. 104 Straight Bevel Coniflex Generator completes gears up to 8½" diameter and 1⅜" face width, and from 20 to 3 DP.

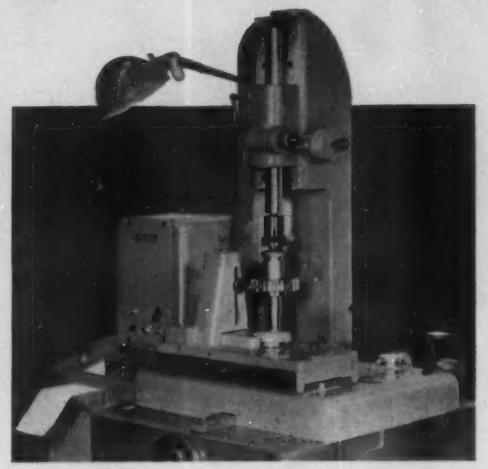
*Coniflex® straight bevel gears with localized tooth bearing.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years

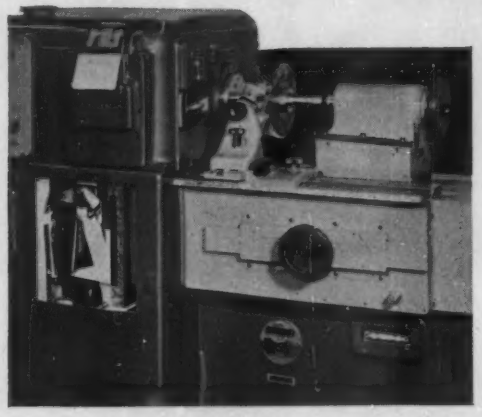
1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

GEAR COSTS



FOR CHECKING INVOLUTE PROFILES

Two Fellows Involute Measuring Instruments with capacities of 12 and 24 inches p.d., electronic recorders, chart readings at 500 to 1 magnification.



FOR CHECKING LEAD

Fellows Lead Measuring Instruments also in 12 and 24 inch capacity, chart errors at 500 to 1 magnification, also for checking crown and taper; no involved calculations.

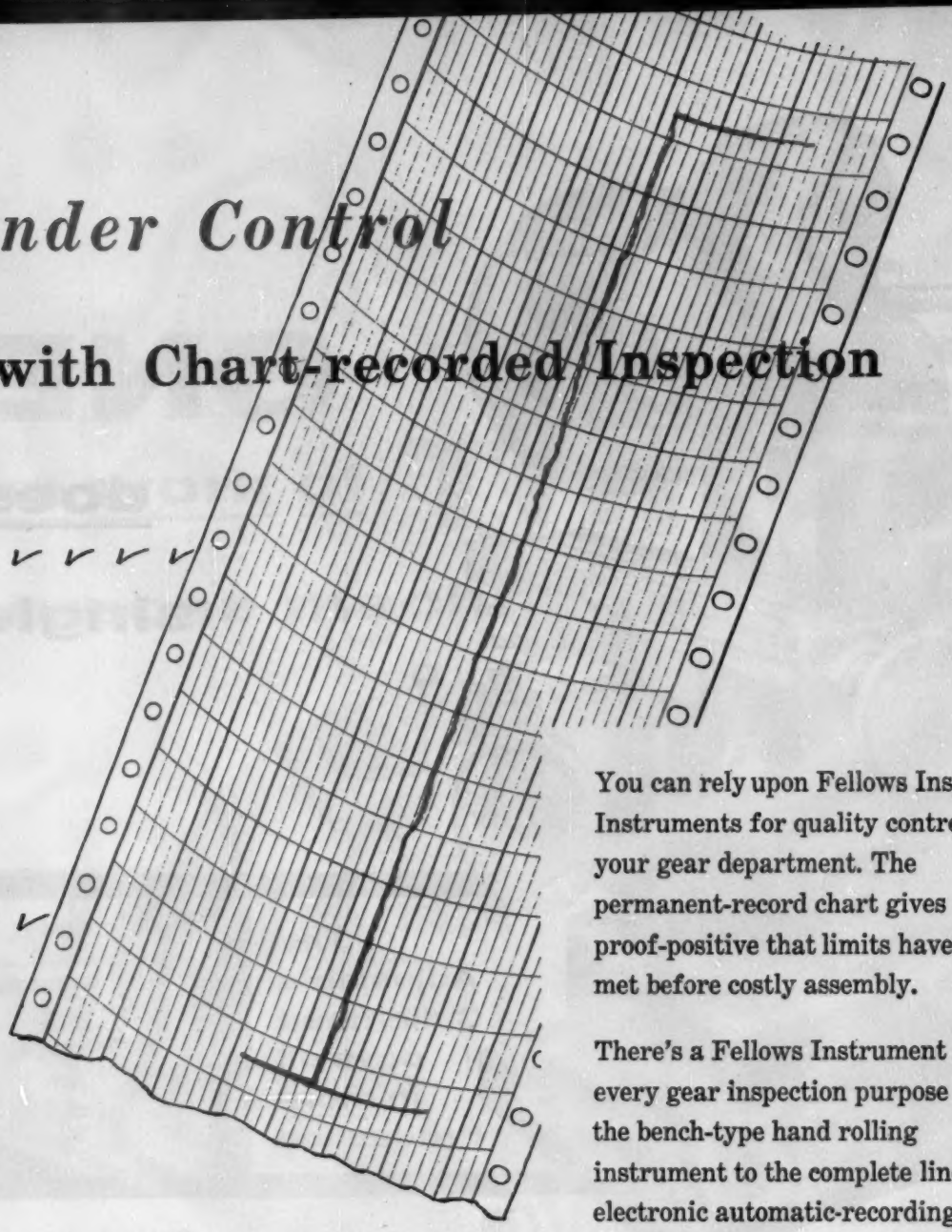
FOR COMPOSITE CHECK

Fellows Red Liners in 3 capacities up to 18 inches p.d. automatically record all gear errors in combination on a chart as the precision master gear rotates in contact with the gear being checked.

THE

under Control

with Chart-recorded Inspection



You can rely upon Fellows Inspection Instruments for quality control in your gear department. The permanent-record chart gives proof-positive that limits have been met before costly assembly.

There's a Fellows Instrument for every gear inspection purpose from the bench-type hand rolling instrument to the complete line of electronic automatic-recording types. Literature and sales-engineering advice on any or all is yours for the asking. Contact the Fellows office nearest you.

Fellows GEAR SHAPER COMPANY

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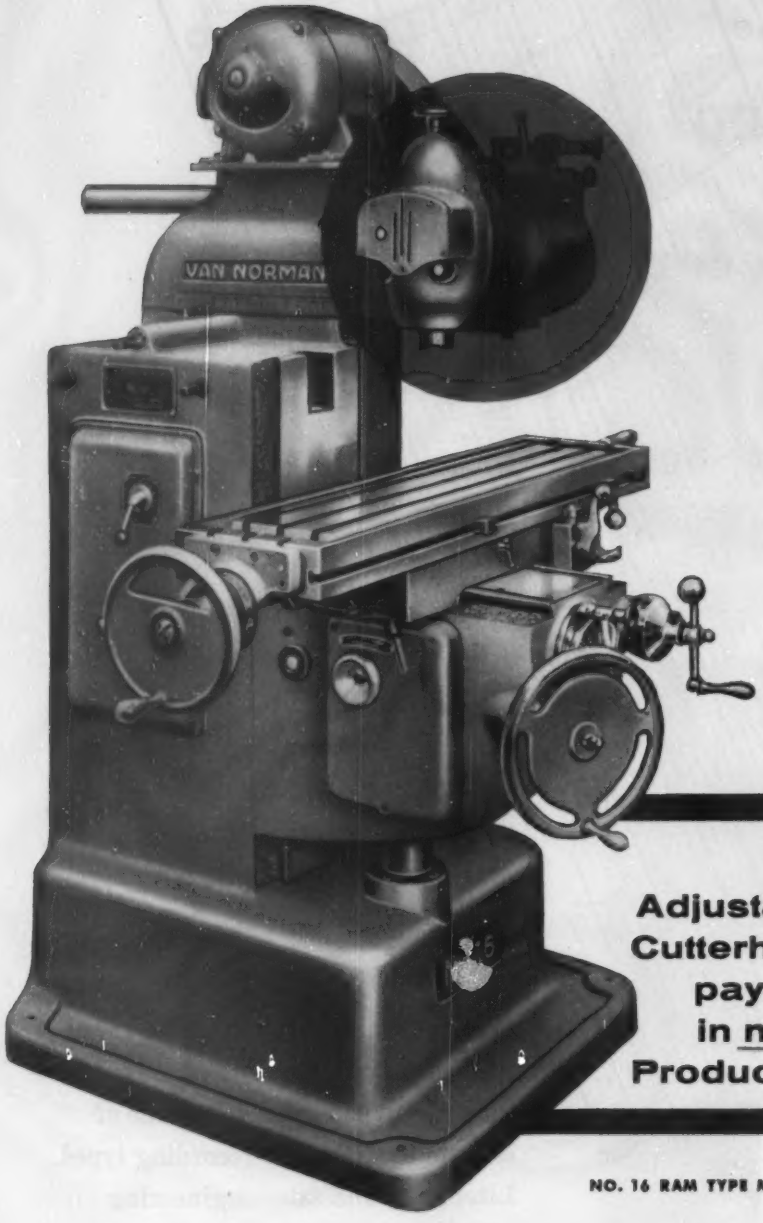
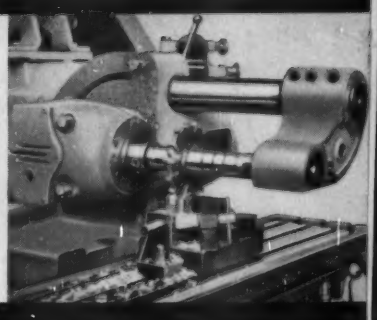


ONE does single

The Adjustable Cutterhead pays off in more Production



NO. 16 RAM TYPE MILLER

HORIZONTAL MILLING

Operator simply swivels the adjustable cutterhead to horizontal position . . . locks it in place . . . and he is ready for horizontal milling. Hardened stop set at factory assures positive 0° setting.

Conventional horizontal and vertical, as well as angular milling all on ONE miller . . . that's what you get with Van Norman Ram Type Milling Machines. The adjustable cutterhead, mounted on a movable ram, enables you to perform all types of milling by simply positioning the cutterhead in the desired position. Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

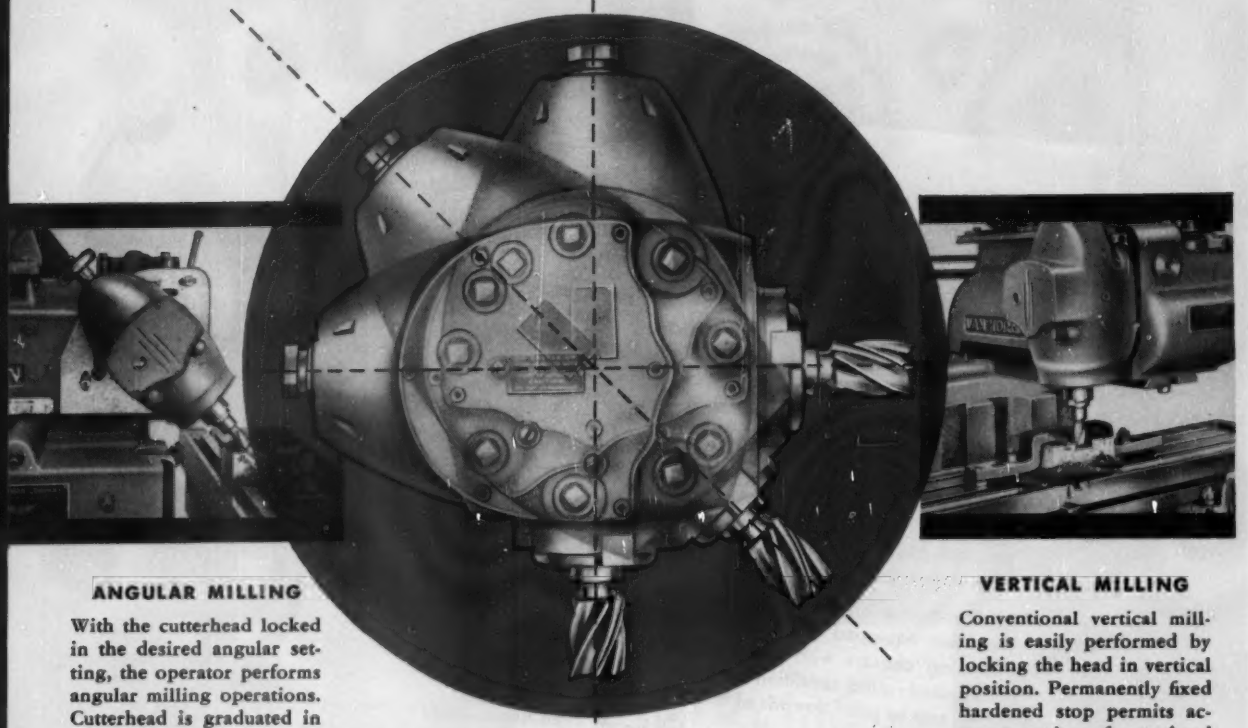
Write for full details today.

VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Van Norman Ram Type Miller

the work of THREE purpose machines



ANGULAR MILLING

With the cutterhead locked in the desired angular setting, the operator performs angular milling operations. Cutterhead is graduated in degrees from 0° to 90° for easy positioning.

VERTICAL MILLING

Conventional vertical milling is easily performed by locking the head in vertical position. Permanently fixed hardened stop permits accurate setting of cutterhead at 90°.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

ACME Better

A LANDMACO Threading Machine is today playing an important part in the production of top-quality stainless steel valves at The Cooper Alloy Foundry Co. in Hillside, New Jersey.

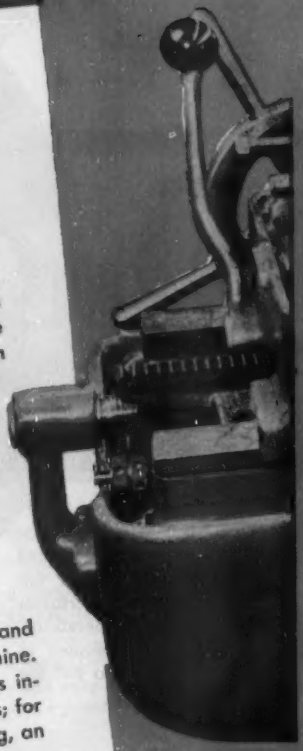
One operation, illustrated here, involves cutting ¼" pitch ½" lead Acme threads on 1⅝" diameter 304, 316, and 347 stainless steel valve stems. Both thread finish and concentricity are improved over previous threading methods, important factors in meeting the rigid quality standards for "certified" Cooper Alloy valves. IN ADDITION, large production savings are being realized. Each valve stem is threaded with a full 15⅞" thread in 2.5 minutes floor-to-floor time—as against 204 minutes by the previous method. Large savings are also being made in set-up time and in tool cost.

This operation is performed by a 2½" LANDMACO Leadscrew Machine equipped with a 2½" R LANCO Head using roughing and finishing chasers with centering throats. These chasers eliminate the out-of-round condition so common in long workpieces and produce coarse pitch threads of excellent finish in one pass.

Other valve stems, requiring left-hand, right-hand, double-start, and single-start threads, are also produced on this same LANDMACO Machine. These threads range from ⅜" to 1⅝" in diameter, and thread forms include both Acme and U.N. Tool cost is low in all of these operations; for example, when producing a ¾" 6 pitch single Acme thread 5⅛" long, an average of 500 pieces was threaded between chaser grinds.

This case history in just one plant illustrates the possibilities of the LANDMACO Threading Machine in Thread Production—a better quality thread, a lower thread cost, a greater versatility of production. Are there Threading Operations in your plant where these benefits might be realized?

Write for Bulletin H-75.



WORLD'S LARGEST

THREADS - - -
Finish at Lower Cost !!
LANDIS Machine COMPANY
WAYNESBORO • PENNA.
EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

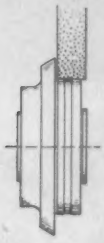
External and Internal Grinding In One Setup

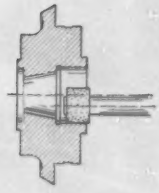
A cost-cutting advantage of Landis 10" and 12" Type CH Universal Grinders.

LANDIS

precision grinders

External Diameter is Ground





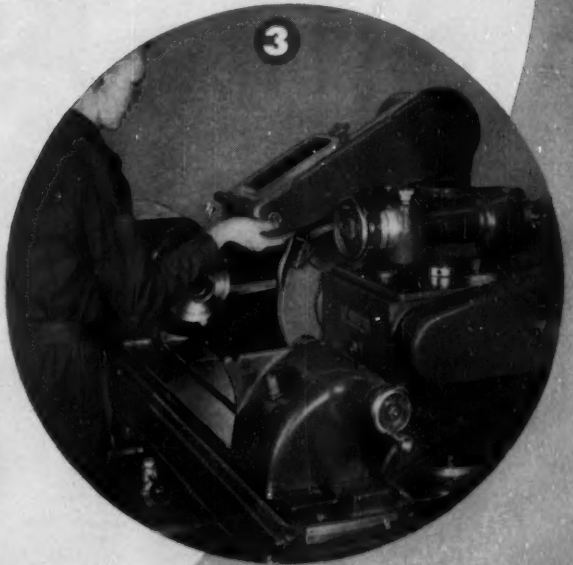
Hole is Ground—Work Piece Finished!

Wheel Head Moves Back by Power

Rapid hydraulic positioning speeds wheel positioning . . . reduces operator fatigue.

Internal Fixture Swings Down

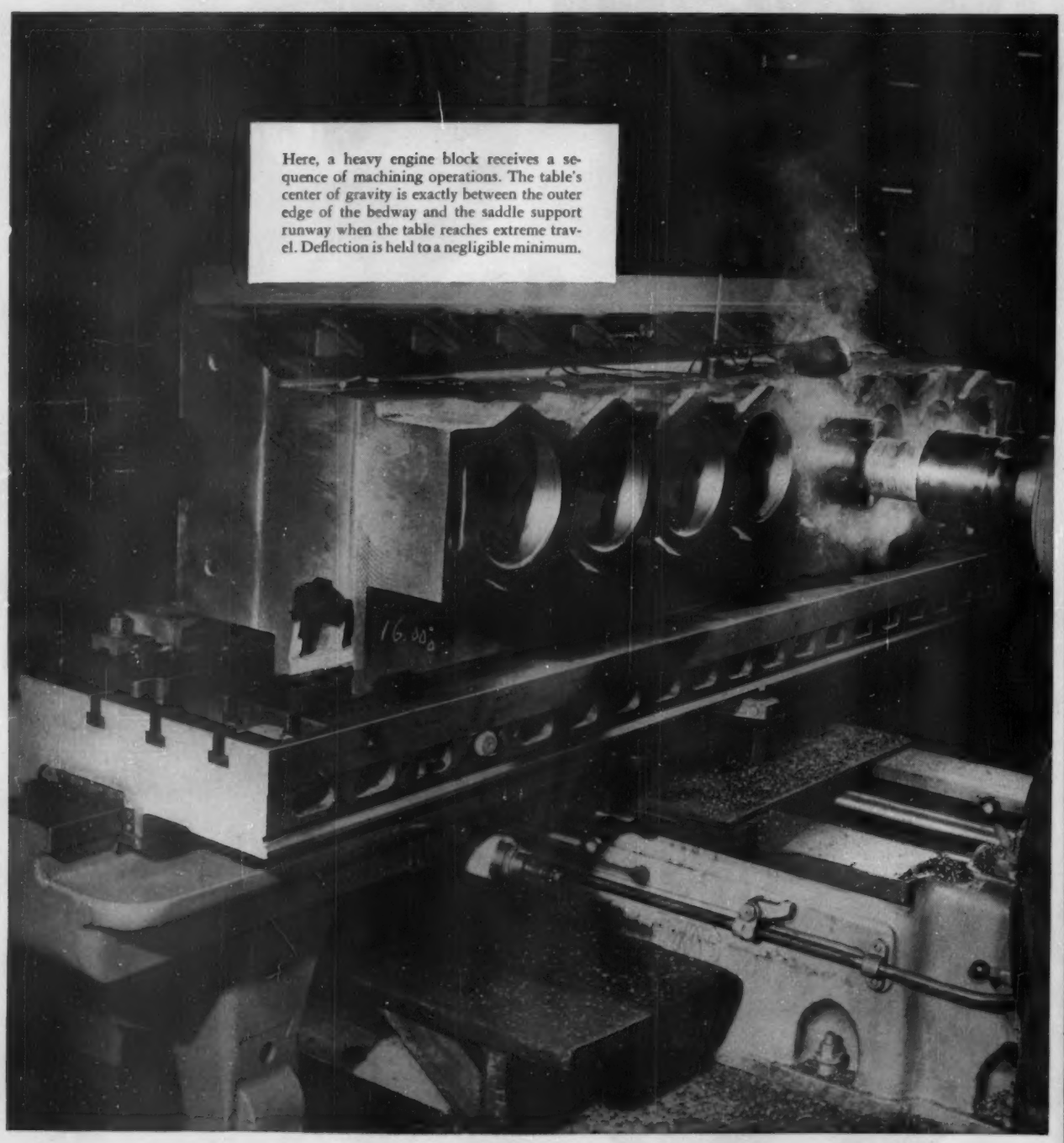
Swinging bracket fixture lowered easily to grinding position . . . no belts to adjust.



LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U. S. A.

G&L 30 Series offers over the widest working



Here, a heavy engine block receives a sequence of machining operations. The table's center of gravity is exactly between the outer edge of the bedway and the saddle support runway when the table reaches extreme travel. Deflection is held to a negligible minimum.

you greatest precision ranges...HERE'S PROOF

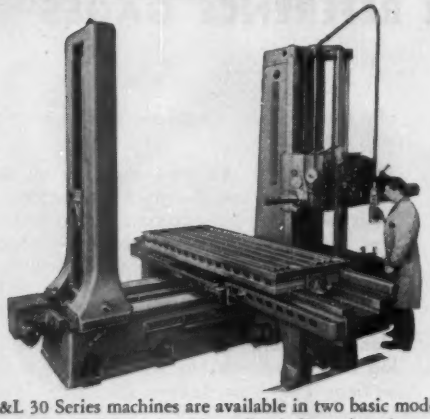
Extended saddle, saddle supports and auxiliary runways are available with G & L 30 Series Table Type Horizontal Boring, Drilling and Milling Machines. This exclusive method of supporting the table takes the risk out of precision-machining large workpieces requiring full range of the machine.

A *fully-supported,* extended saddle is absolutely vital when a long table and high columns are used to precision-machine a sequence of different surfaces on a heavy workpiece. The G&L design incorporates an extended saddle that minimizes deflection and is provided with full support even when the table is at its outermost travel limits.

What's more, G&L has engineered a system of concentric leveling (see lower right) which insures perfect alignment and parallelism between rails, saddle supports, saddle and table.

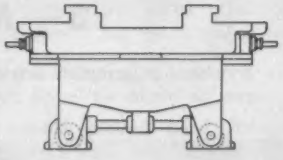
These are only a few of the many advantages you get with a modern G&L Horizontal. A selection of many other standard and optional features gives you the exact machine you need — a machine that's unsurpassed for accuracy, capacity, simplified operation and years of outstanding performance.

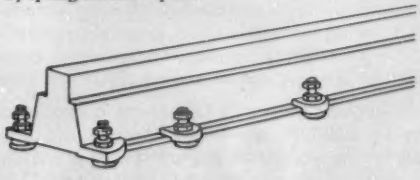
For complete details, see your G&L representative or write for catalog No. 30.



G&L 30 Series machines are available in two basic models — the 350-T (shown) with a 5" spindle and 25 hp, and the 340-T with a 4" spindle and 20 hp. Note how the under-the-floor runways allow the operator to perform his job without having to climb over the machine.

Adjustable brackets with hardened and precision-ground steel rollers. Located one to each support leg, they engage hardened and ground steel rails, are protected by spring-loaded wipers.



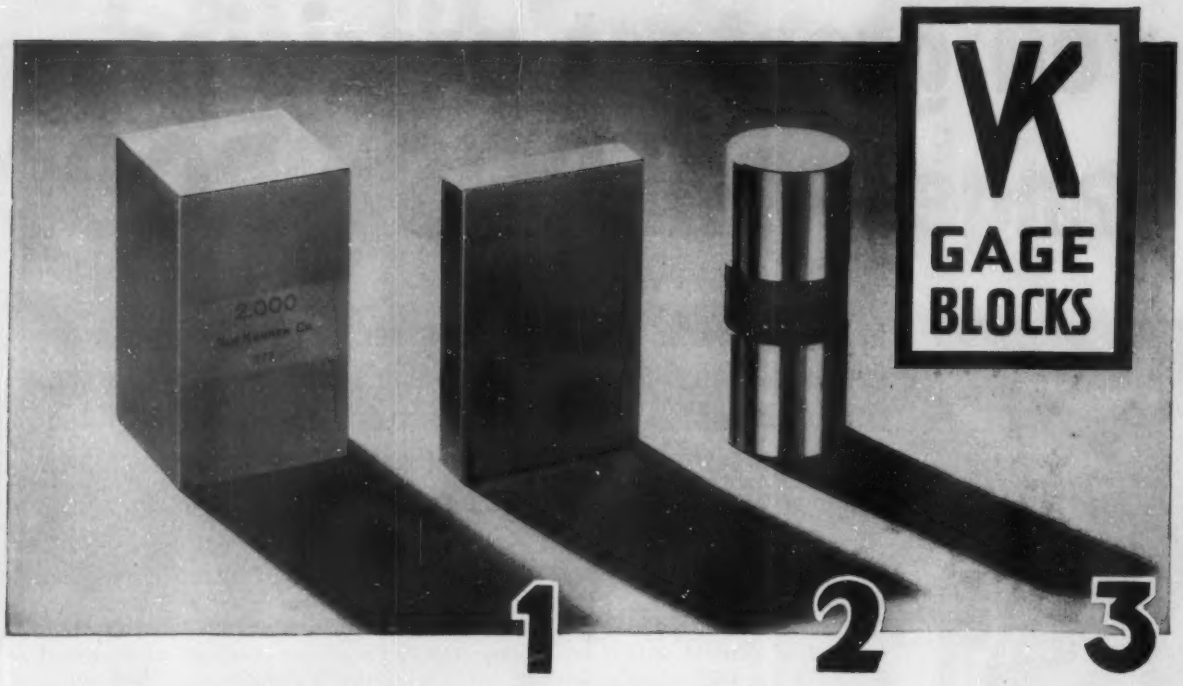


On runway, large diameter adjusting screws are threaded through flange and drilled to receive foundation bolts. Rails are sunk into foundation so tops are even with floor level. Rails and machine are separately leveled and saddle support brackets adjust independently.

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN



THREE WAYS *to protect production accuracy*

To meet closest limits of accuracy and protect production, Van Keuren is currently furnishing three types of gage blocks:

1—SOLID SQUARE MASTER BLOCKS
2—RECTANGULAR REFERENCE GAGES
3—MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision setup work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are now made to an accuracy of .000008" and are designed as working gages for shop use . . . to put accuracy at the machine. Wearing surface of these ⅜" diameter gages is 40% greater than that of rectangular gage blocks hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

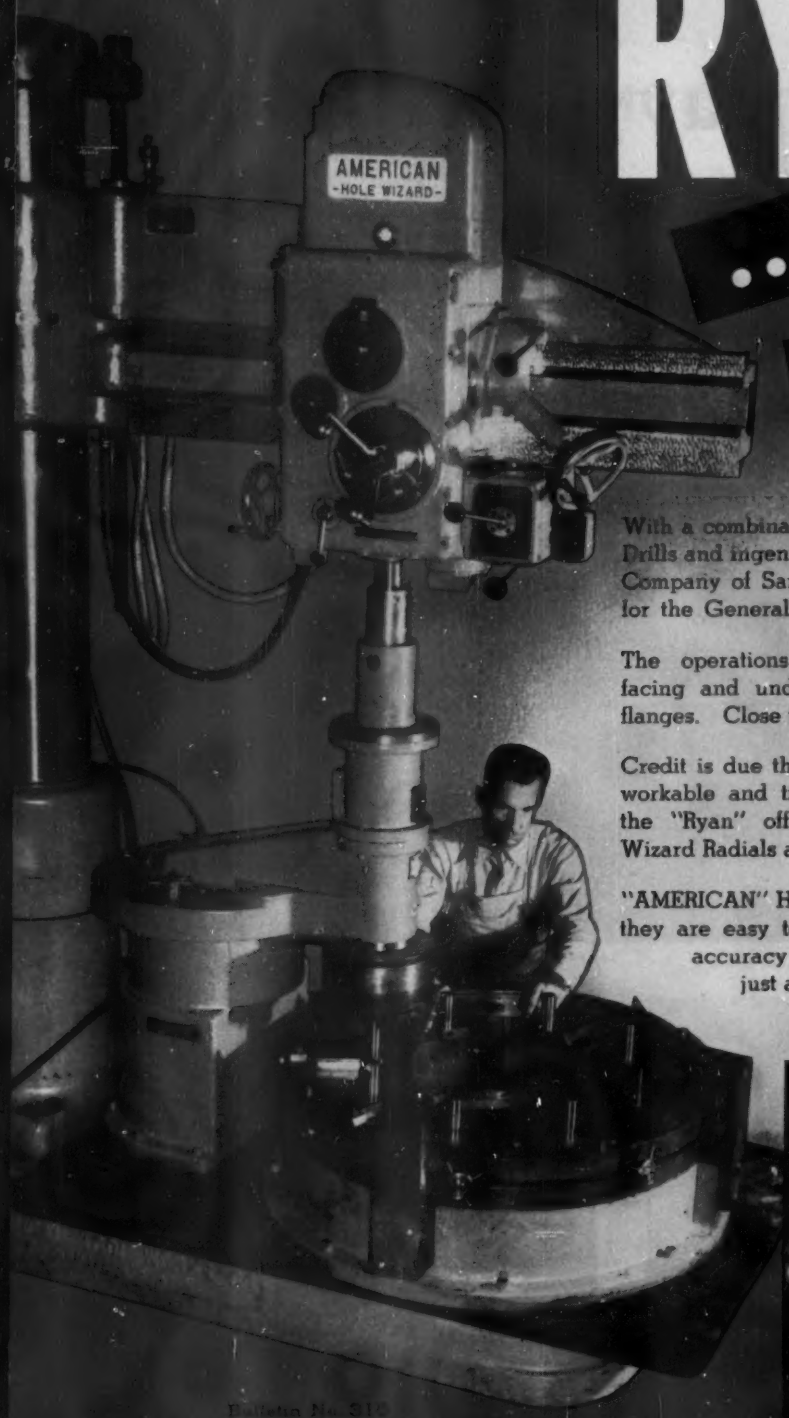
VK
35th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

RYAN ...HITS THE JACKPOT!

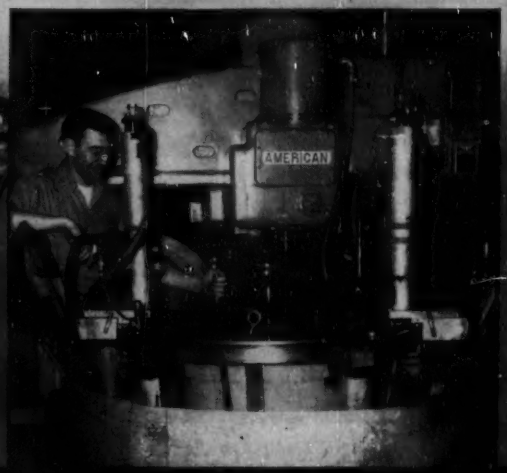


With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.

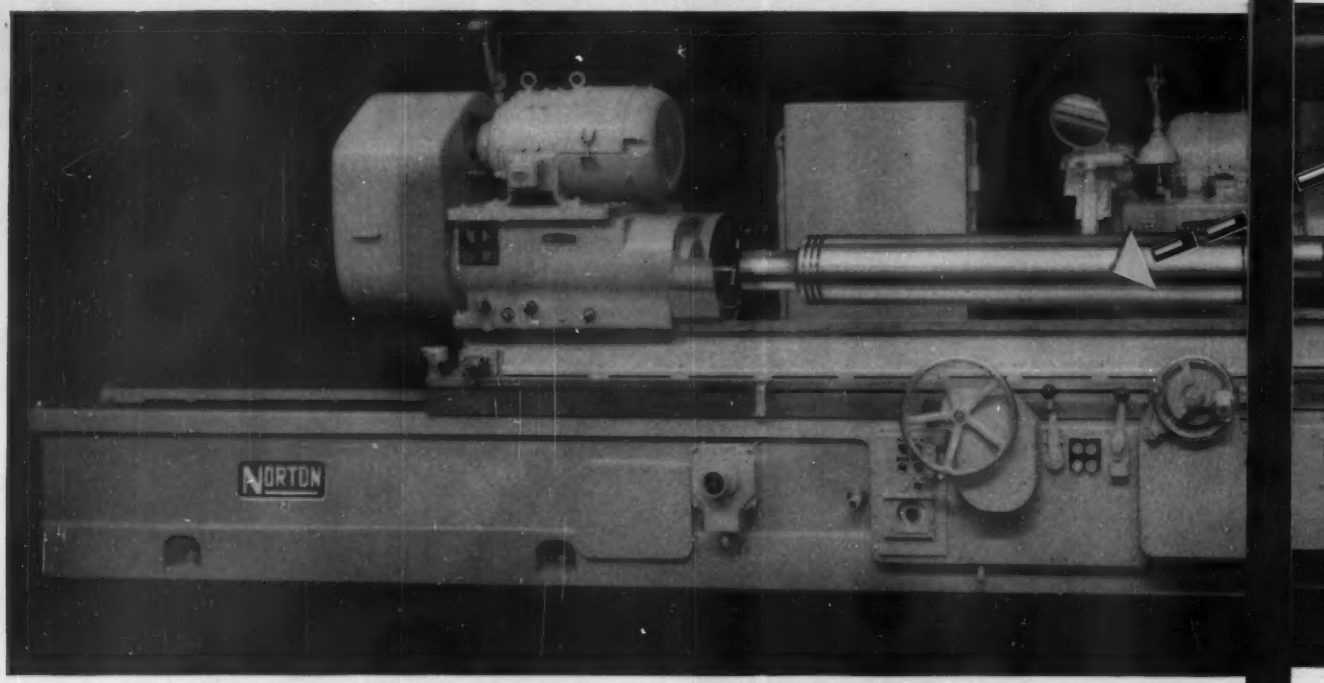


Bulletin No. 512
will give you the facts

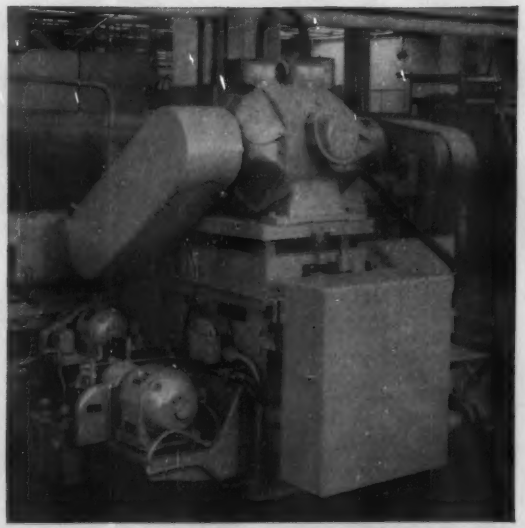
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Here's a heavy duty grinder



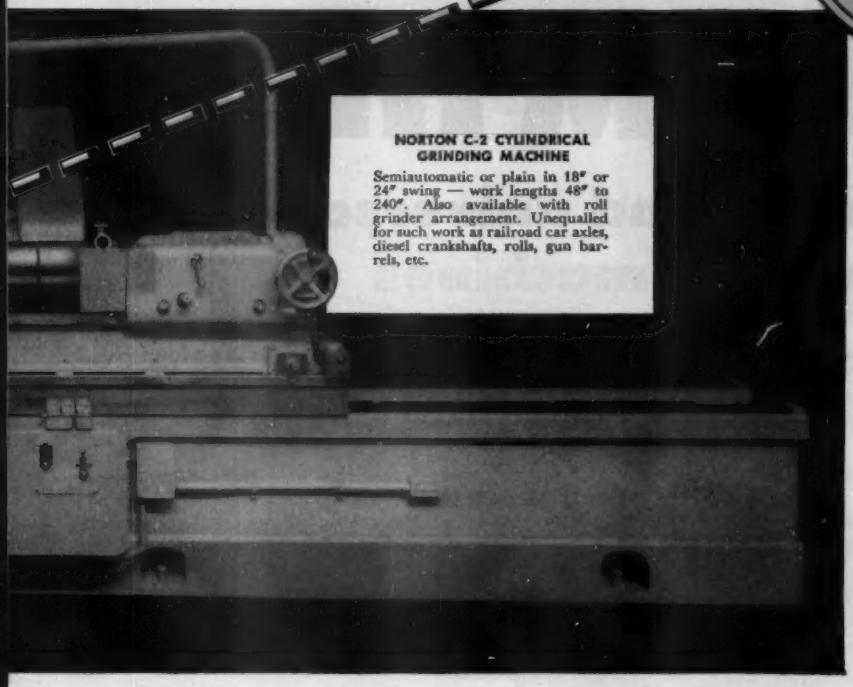
Easy To Set Up And Operate. All controls in front for minimum set-up time, quick change-over and no reaching by operator. Graduated wheel hand feed indicates feed. "Click-counter" signals adjustment for each .0001" reduction in work diameter. Table-truing and grinding speeds may be pre-set, and obtained by selector lever.



Easy To Maintain. All maintenance points on outside. Pumps, motors, filters, lubrication valves and all reservoirs easily accessible. Electrical controls grouped for easy inspection and enclosed for protection.

that can produce

bigger profits for you


NORTON C-2 CYLINDRICAL GRINDING MACHINE
Semiautomatic or plain in 18" or 24" swing — work lengths 48" to 240". Also available with roll grinder arrangement. Unequalled for such work as railroad car axles, diesel crankshafts, rolls, gun barrels, etc.

The new Norton C-2 Cylindrical Grinder is available in 3 arrangements: Plain Semiautomatic Roll

Faster cutting . . . quicker set-up . . . easier operation . . . less down time

This is the kind of grinding machine you expect from Norton — one that's tops for accuracy, production rate and ease of operation.

The new C-2 gives you more heavy production because it works more of the time — and works faster and easier.

When arranged for Semiautomatic operation all your operator does is to move a single lever for automatic grinding to exact size and finish.

When arranged as a Roll Grinder the famous Norton tilting wheel head mechanism is supplied. This moves the grinding wheel contact point away from or toward the axis of the roll as the roll is traversed past the wheel face.

Remember: only Norton offers you such long experience in both grinding wheels and machines, to help you produce more at lower cost.

Your Norton Representative will be glad to give you all the facts on the new C-2 and to discuss your grinding problems. Or write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

District Sales Offices: Worcester • Hartford • New York (Teterboro, N. J.) Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

Announcing...

Kearney & Trecker's

NEW RAM HEAD

plain and universal milling machines

KEARNEY & TRECKER'S new line of Ram Head milling machines combines a conventional horizontal spindle and a self-contained motorized sliding ram. As a result, horizontal and vertical spindles can be run separately and simultaneously.

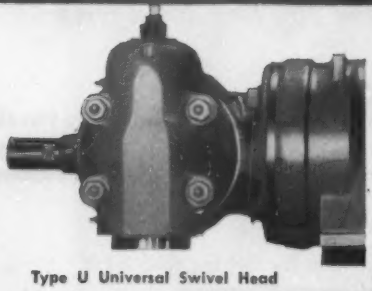
The Ram Head machines are available with a choice of three heads — Universal, Vertical and Quill types which can be rotated through 360°. You can perform vertical, horizontal and angular milling on one machine *in a single setup.*

Ram Head machines are highly versatile and exceptionally economical for general purpose production milling. They are built in Model CH, CK and CSM designs with 69 different machines in sizes from No. 2 to No. 4 in both plain and universal styles. Machines may be equipped with either Standard Directional Table Control, or Mono-Lever and Automatic Cycle Table Control.

To afford greater versatility with minimum maintenance, the Ram Head is individually motor-driven . . . has its own lubrication system and speed change mechanism. When used as a standard horizontal machine, the ram acts as a heavy-duty arbor support.

For the full story, contact your nearest Kearney & Trecker representative, or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

with choice of three types of heads

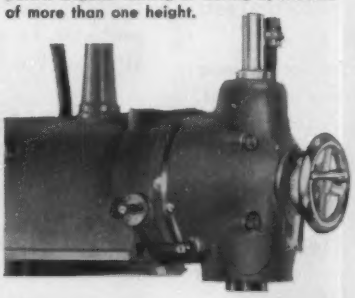


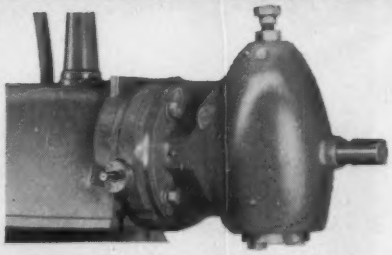
Type U Universal Swivel Head

Capable of numerous milling combinations, this Universal Swivel Head has two graduated bases at right angles to each other, both of which can be swiveled through 360 degrees. Head is rotated by worm and worm wheel with adjustment by hand crank.

Type Q Adjustable Quill Swivel Head

Spindle can be set at any angle through 360 degrees. This Ram Head has a 3½" hand-feed quill movement. In addition, four-position micrometer stop and dial indicator permit angular milling or boring operations of more than one height.



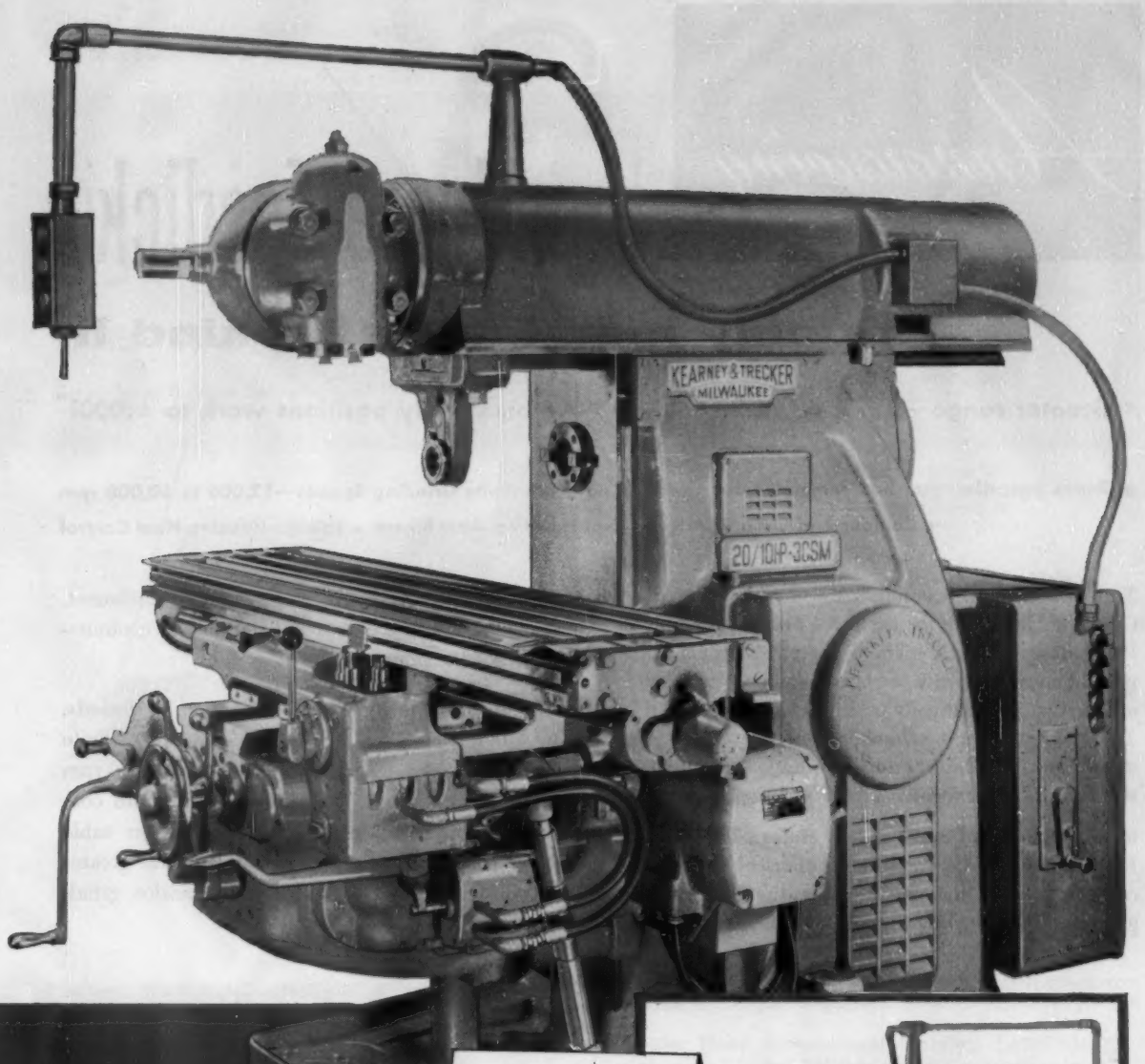


Type V Vertical Swivel Head

Especially adapted for vertical and angular milling operations. Spindle housing base of Vertical Swivel Head is graduated. Spindle can be set at any angle up to 360 degrees.

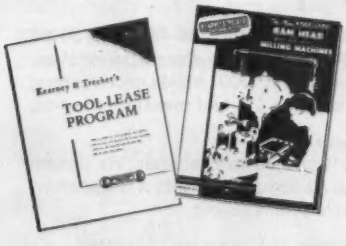
Kearney & Trecker Corporation

MILWAUKEE 14, WISCONSIN



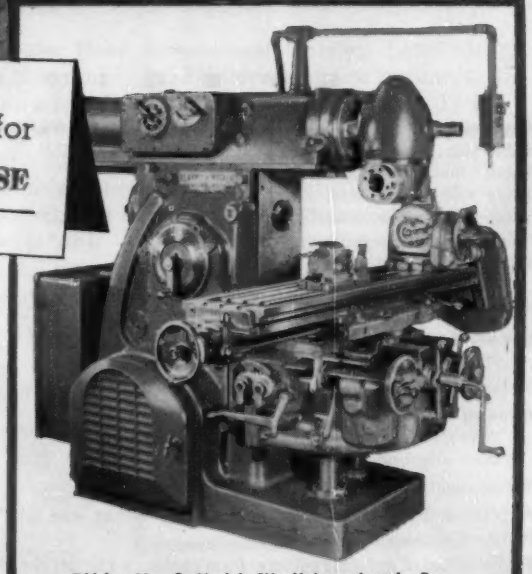
20/10 hp No. 3 Model CSM, Plain style Ram Head milling machine with Mono-Lever and Automatic Cycle Table Control and Type U Universal Head.

available for TOOL-LEASE



FREE CATALOGS!

Ask for catalog No. RH-10A for complete data on Ram Head plain and universal milling machines, and Tool-Lease bulletin, TL-10A. Also see our catalog in SWEET'S.



7½ hp No. 3 Model CH, Universal style Ram Head milling machine with standard Directional Table control and Type U Universal Head.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Announcing the Moore-Fosdick

The only machine of its kind in

• Greater range—22" x 42" x 27" height • Automatically positions work to ±.0001"

• Grinds jigs, dies, punches, templates and machine parts • Infinite Grinding Speeds—12,000 to 60,000 rpm • Contour and Chop Grinding • Slot Grinding Attachment • Spindle-Housing Heat Control

This new machine combines the unique Moore Jig Grinding Head with the exclusive Fosdick Automatic Positioning Table. It gives you greater capacity for precision grinding with the speed and convenience of a table that automatically positions work to ± .0001". *There is no other machine in the world that even approaches the Moore-Fosdick in jig-grinding capacity, versatility, convenience and precision!*

Grinds Cylindrical and Tapered Holes. The Moore-Fosdick allows you to grind cylindrical as well as conical holes, with taper in either direction. An angular and indexing device built into the main spindle, and the newly developed slot grinding attachment, permit the quick, accurate grinding of any contour—*regular* or *irregular*.

Large Work Capacity—Infinite Number of Speeds. The Moore-Fosdick A. P. Jig Grinder has an infinite range of grinding speeds – from 12,000 to 60,000 rpm . . . allowing extreme versatility and accurate control of grinding and stock removal. Larger table size and greater work height, coupled with greater power, *extend* the overall range of precision grinding operations.

SPECIFICATIONS

Capacity:	No. 30-G	No. 42-G & No. 42-PG*
Table size	36"x18"	44"x22"
Table travel, Longitudinal	30"	42"
Table travel, Crosswise	17½"	22"
Table top to wheel collet	2" to 27"	2" to 27"
Spindle to column ways	18½"	18½"
Spindle to column below ways	20"	25¼"

Four spindle speeds: 90, 120, 180, 240

Spindle feeds by air-powered hydraulic control—infinite speed control

Grinding speeds: 12,000 to 60,000 rpm; 3 heads

Grinding Capacity:
With grinding wheels, 3/16" to 5" (8" with adapter)
With diamond mandrels 1/4" to 3/4"

Travel main spindle slide... 3½"

Angular adjustment of spindle up to 1½° either way or 3° included angle.

Radial offset of grinding spindle-from center to 1⅛" off center by rough adjustment-while running 0.0001" adjustment for distance of 0.075" anywhere in the 1⅛" range.

Weights and Floor Space:	No. 30-G	No. 42-G & No. 42-PG
Machine with regular equipment, including motor	6000 lbs.	11,000 lbs.
Shipping weight	6750 lbs.	12,000 lbs.
Floor space	77"x82"	102"x129"

Standard Equipment:
Four-speed constant torque ¼ hp motor, 220-440 volts, 50-60 cycles, 2-3 phase, wheel dresser—micrometer stop-wrenches. Two built-in locating devices: two 1" .0001 inside micrometers; two 1", 2", 3", 4", 5", 10" and one 15" end measurers in box.

Compressed Air Requirements:
90 to 100 lbs. @ 15 cfm, furnished by customer. We recommend a heavy-duty 7.5 hp air compressor with a water aftercooler, provided it is capable of this output.

*42-PG Moore-Fosdick Jig Grinder with Automatic Positioning.

Write today
for price and delivery information.

Jig Grinder

the world!

Grinding Wheel Outfeed, Reads .0001", Adjustable while running
Cross Power Traverse Safety Switch and Positioning Control
Vertical Slide Taper Setting
Positive Adjustable Depth Stop, Micro Setting
Depth Measuring Dial Reads to .001"
Heating Elements for Continuous Temperature Control of Spindle Housing
Grinding Wheel Outfeed Slide, Course Adjustment
Longitudinal Power Traverse Safety Switch and Positioning Control
Measuring Rods or Duplicating Bars
Push Buttons to Control Table and Slide Rapid Traverse and Positioning of Table and Slide
MOORE-FOSDICK

Positions Work Automatically to ± .0001". With the Automatic Positioning Table, you can get fast and accurate positioning of parts to be ground. Two simple duplicating bars may be prepared to position work automatically to ± .0001" -- at the touch of a pushbutton. This means that complex grinding jobs with hundreds of holes require only one set-up. On "one-time" jobs, measuring rods can be used in place of bars. For precision production jobs, the easily-made, easily-stored duplicating bars give you a permanent record of positions. Once a job is run, you store the bars and use them every time you rerun that same job — weeks, months or years later.

Grinder Head Dimensional Stability. Latest design of the grinding head incorporates new features to improve further its stability. These include: (1) Electric heating elements in the main spindle housing to maintain uniform temperature whether machine is running or not; (2) An observation thermometer so located as to indicate any temperature change within the housing; (3) The housing itself is cast from 36% nickel iron to reduce the effect of any possible temperature variation to an irreducible minimum.

Need Drilling Equipment? Get a Proposal from Fosdick!

Radial Drills

Jig Borers

Sensitive and Upright Drills

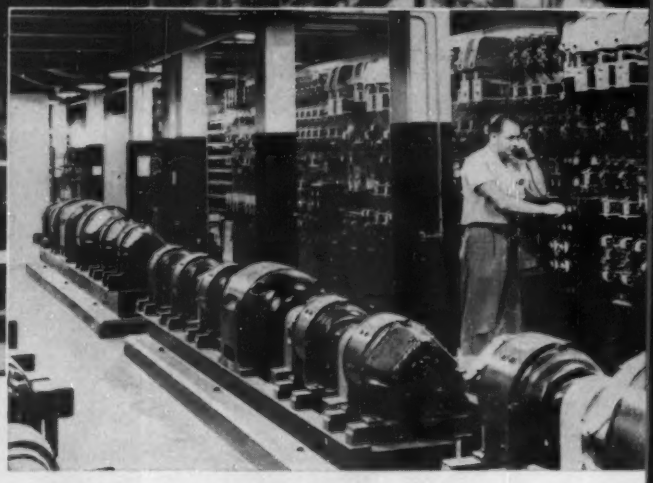
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

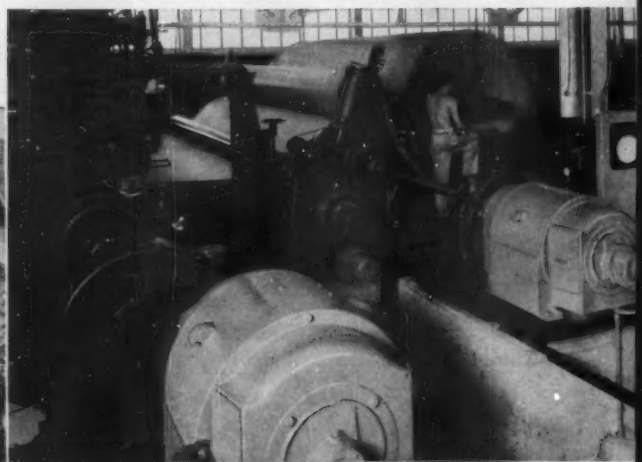
Continuous Output

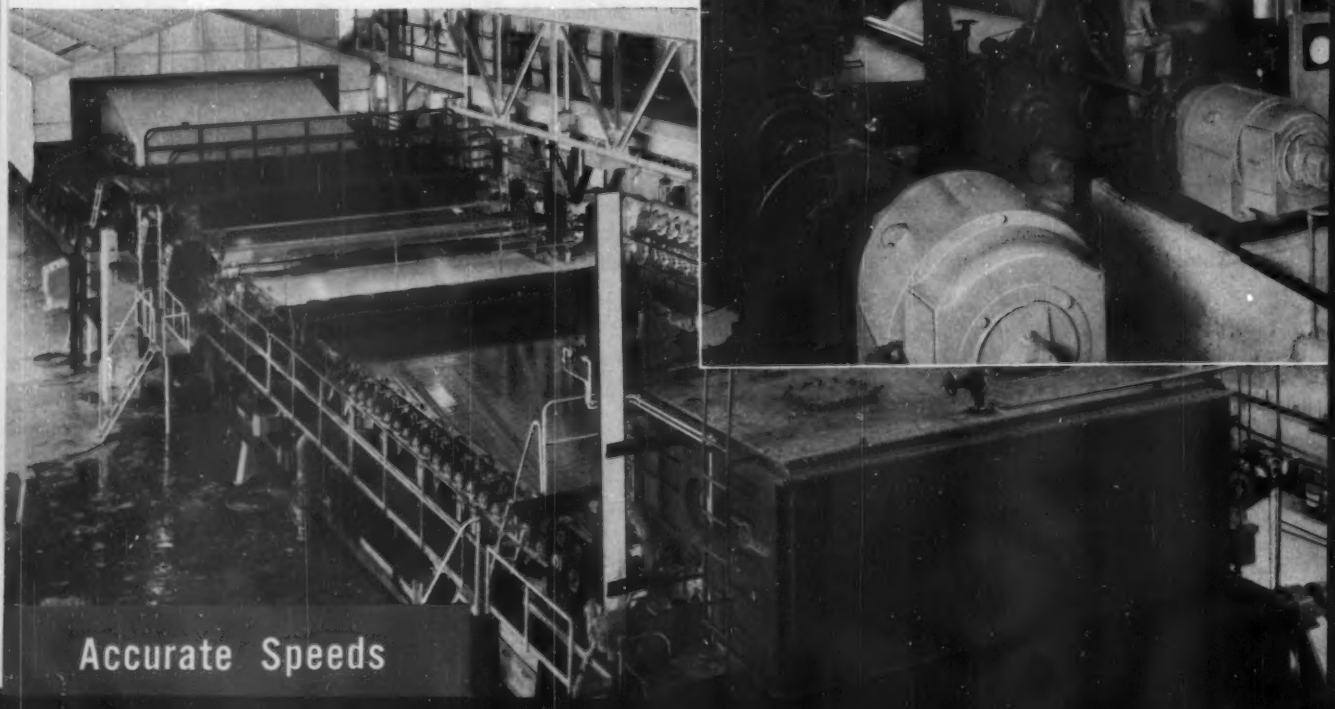


Co-ordinated G-E drive and furnace help produce up to 30 tons/hour of annealed strip. Adjustable voltage d-c generators co-ordinated by modern control provide smooth, fast, precise operation.

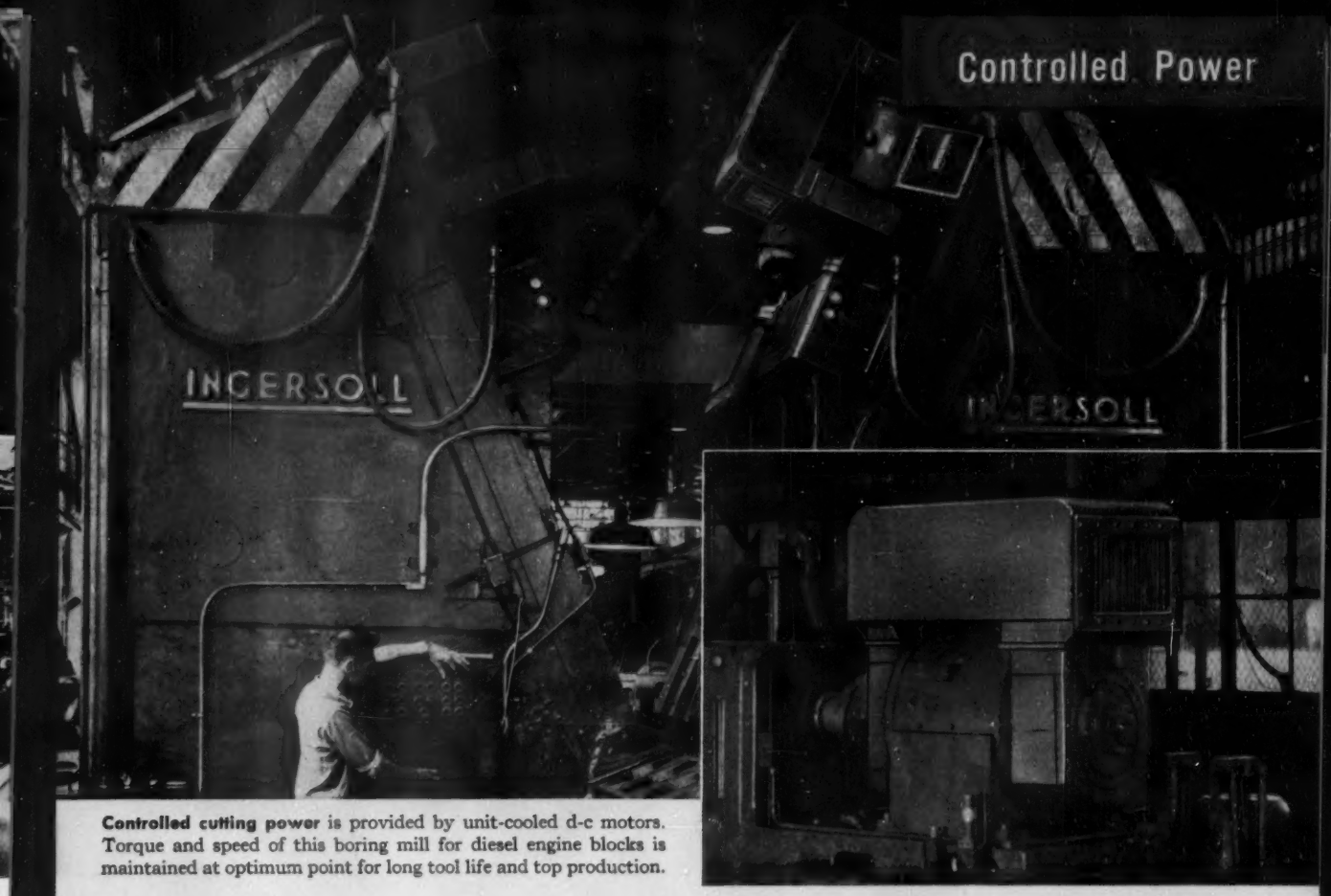
How General Electric d-c drives

Accurate speed from d-c drive co-ordinates sections of paper machine into fast flow of production—up to 300 tons/day. Mechanical design of machine is simplified, output increased.





Accurate Speeds



Controlled cutting power is provided by unit-cooled d-c motors. Torque and speed of this boring mill for diesel engine blocks is maintained at optimum point for long tool life and top production.

help make production automatic

DC MOTORS STEP UP PRODUCTION THROUGHOUT INDUSTRY

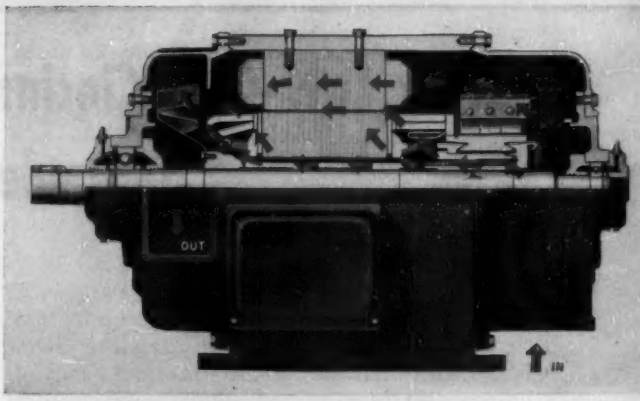
DC drives give you precise control of torque, speed, and power—essential in automatic production. The degree of precision depends on the steady performance and continuity of service of d-c motors and generators. In applications requiring close speed regulation, quick reversing, severe peak loads, G.E.'s complete line of Type CD-1000 motors is:

ECONOMICAL—the right speed at all times means less waste, fast production and low manufacturing costs per unit.

EASY TO MAINTAIN—built for long life with occasional inspection only—easily removable inspection covers. All connections are enclosed, yet easily accessible.

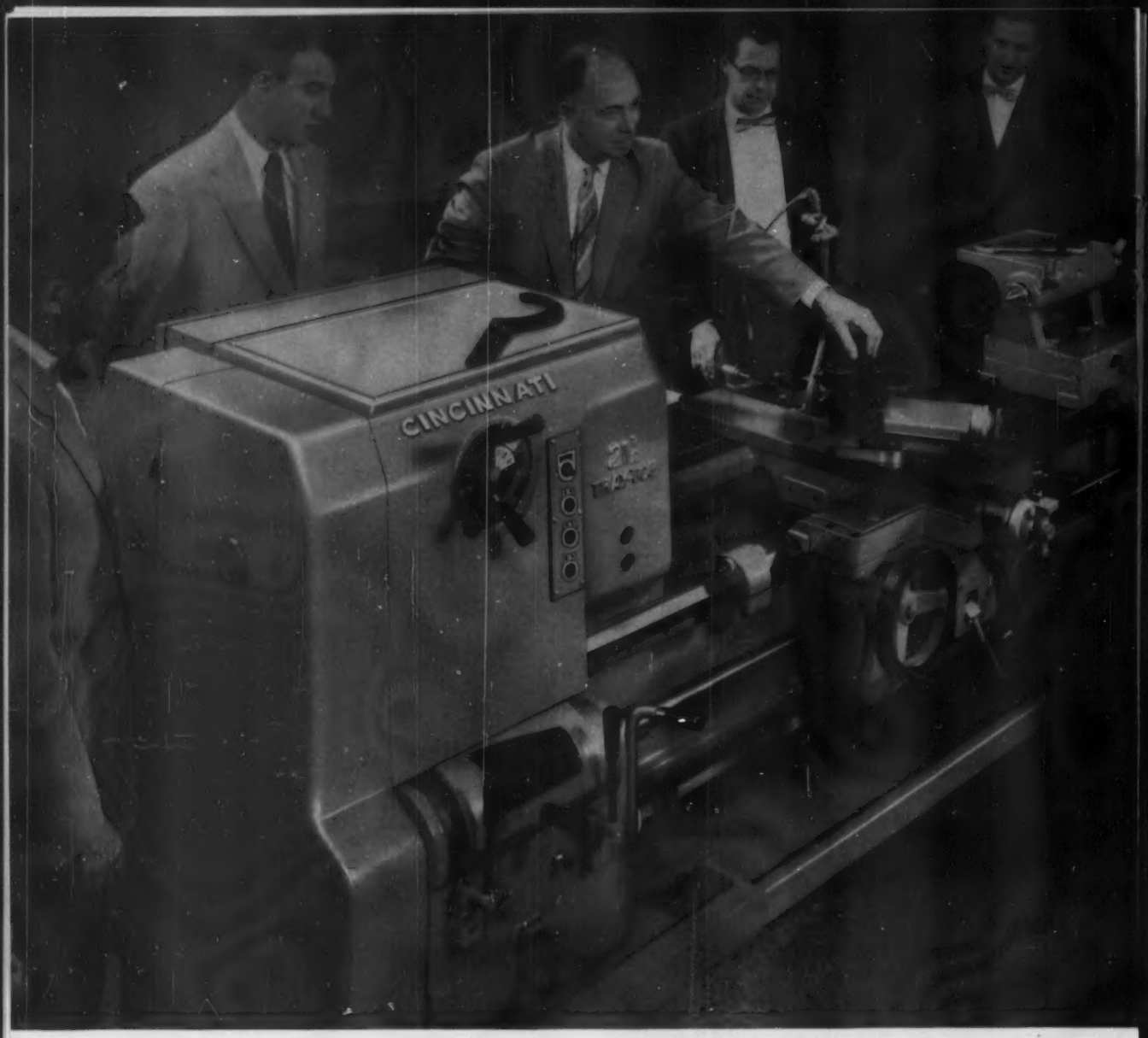
VERSATILE—Today's industry is more automatic than ever before. Regardless of application—in steel, paper, machine tool, and many other industries—G-E direct-current motors have gained the reputation of delivering continuous output at lower costs and accurate speeds for peak production.

FOR MORE INFORMATION, contact your nearest Apparatus Sales representative, or write for bulletin GEA-5497, general-purpose d-c motors, or GEA-6091A, totally-enclosed unit-cooled d-c motors. Section 810-4, General Electric Co., Schenectady, N. Y.



Excellent ventilating system gives positive ventilation to entire motor. Shaft fan on armature helps dissipate heat and keeps motor within rated temperature rise.

GENERAL ELECTRIC



New Low-Cost Cincinnati Lathes Make Debut at Dealer Meeting

Cincinnati's latest lathes—the 21½" and 26" Tray-Tops—made their introductory bow October 18 before the expert eyes of 54 dealers. As a team of designers and engineers presented these brand-new babies, here's what these dealers saw and liked:

Lathes with 12 all-geared spindle speeds from 24 to 960 rpm in the high range—with 54 thread and feed changes—flame-hardened ways to retain built-in accuracies—Cincinnati's exclusive Color Match Speed Selector—a totally enclosed quick-change box and hardened gears in all three transmissions.

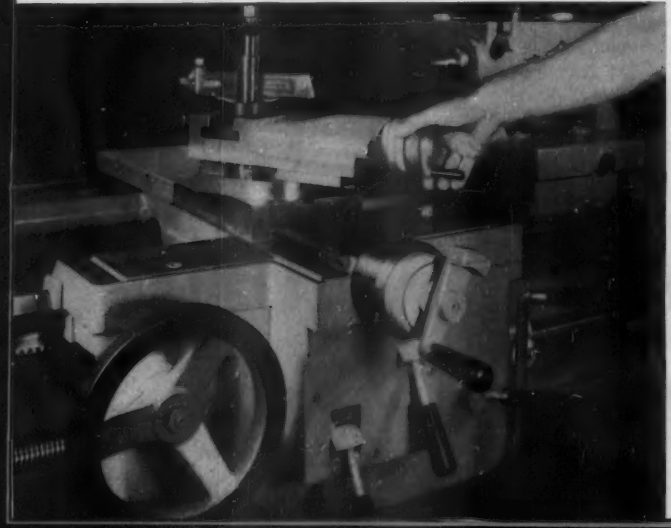
Best of all, they saw lathes priced well within the reach of every shop.

These low-cost Cincinnati Tray-Tops are so new that not all dealers have been supplied with display models. But that needn't keep you from getting the details now. Just write for Catalog T-117 and we'll rush complete descriptive literature. No obligation, of course. Cincinnati Lathe & Tool Co., 3253 Disney St., Cincinnati 9, Ohio, U. S. A.

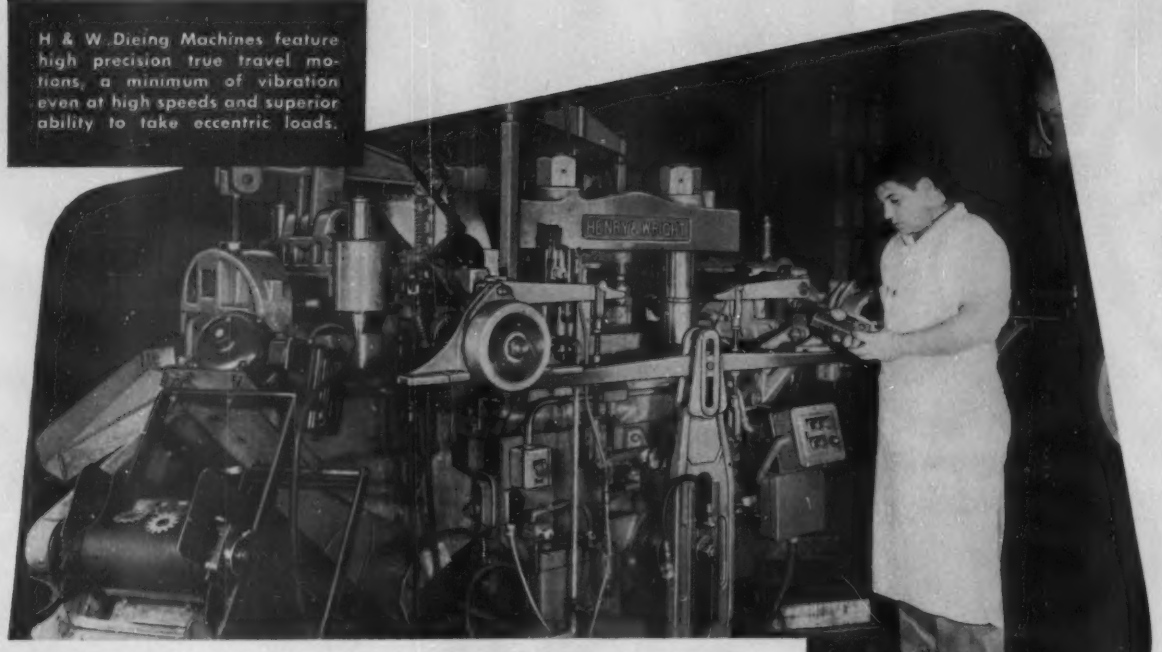
TOTALLY ENCLOSED QUICK-CHANGE BOX guards gears against dirt, chips and foreign matter. It also provides a built-in oil reservoir for automatic lubrication. 54 thread and feed changes—range of 1½ to 92 threads per inch; range of feeds .0019 to .1215.

APRON is a one-piece, double-walled casting providing adequate support for all shafts. It incorporates a built-in safety clutch, oil shot pump lubrication and positive jaw feed clutches.

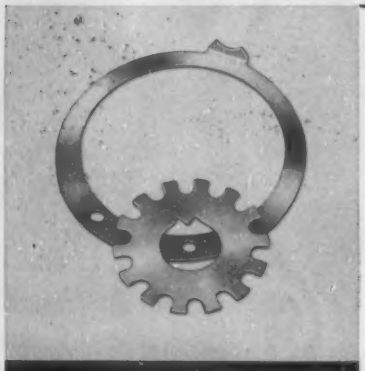
COLOR MATCH SPEED SELECTOR is simplicity, itself. No more reference to index plates and lever positions; just match up the color lines. Spindle speeds range from 16 to 640 rpm (standard) or 24 to 960 rpm (high). Pressurized lubrication to bearings and gears. Three-bearing spindle. 2⅞" diameter spindle hole available.



H & W Dieing Machines feature high precision true travel motions, a minimum of vibration even at high speeds and superior ability to take eccentric loads.



RUNS FROM 1 TO 1,000,000 PIECES



Parts like these, and three changeovers per day, too!

and nothing is made for stock

Production runs are from 1 to 1,000,000 pieces. Alloys, stock sizes, toolings differ for nearly every run. Yet Henry & Wright Dieing Machines in the plant of Wallace Barnes Company, Bristol, Conn., take care of this with nary a need to carry any of the production in stock.

Tooling changeovers are quick. Hence, deliveries are quick.

Precision is high. Hence, spoiled work scrap is low.

Some of the alloys are tough, others are highly workable. Some of the shapes are intricate, others are simple. None of the dies are "special for these machines"; all will fit any presses of sufficient tonnage in the shop.

Two, and even three, die changes are made per shift with no trouble at all. Henry & Wright Dieing Machines displaced five "conventional" ones.

Could your shop use a production method that is as simple, certain and smooth as this one? Would you like machines that can eliminate shelf inventory as a necessity for quick deliveries?

There is a lot more to the story. Please let us tell you all about it. Write to Henry & Wright, Division of Emhart Mfg. Co., 481 Windsor St., Hartford, Conn.

H & W Dieing Machines are available in capacities from 25-ton to 2500-ton.

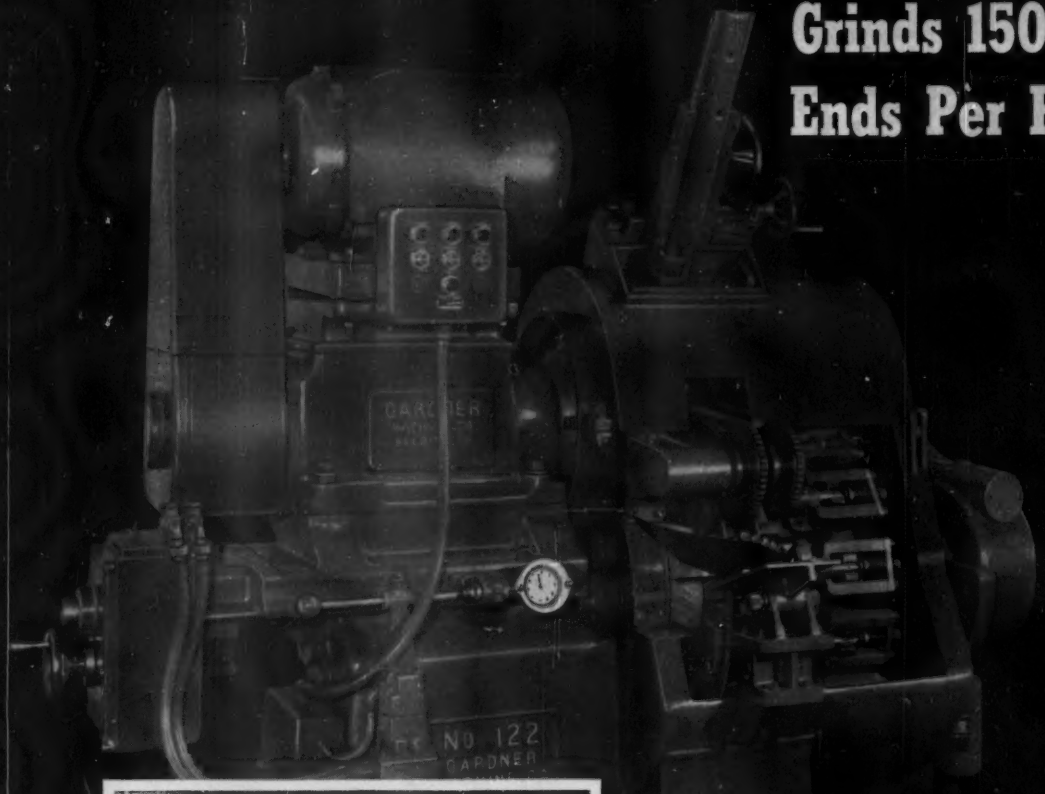
HENRY & WRIGHT

Division of Emhart Mfg. Co.

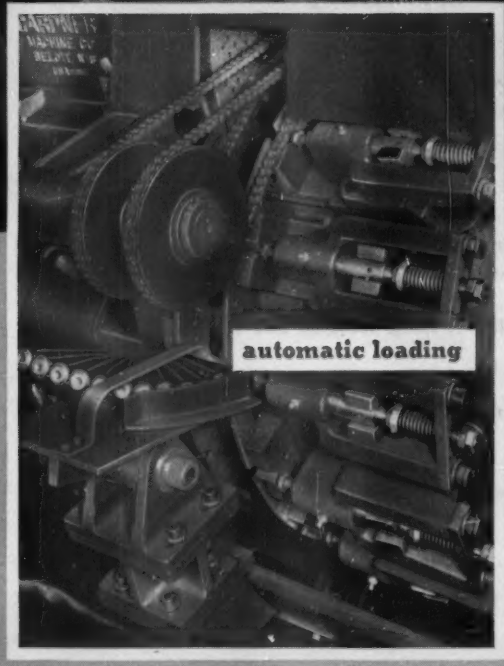
HARTFORD, CONNECTICUT

Semi-Automatic Gardner Disc Grinder

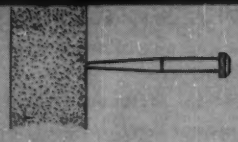
Grinds 1500 Spindle Ends Per Hour



automatic unloading



automatic loading



work data	
MACHINE	Gardner No. 122-23" Single Spindle Grinder.
PART	Cotton picker spindle.
PRODUCTION	1500 per hour.
STOCK REMOVAL	5/16" maximum.
TOLERANCE	.004" for uniformity.
TOOLING	Vee-notched rotary work carrier with gravity-type magazine feed and double chain hold-down.
ABRASIVE	Gardner Yellow Rim Wire-Lokt Disc.

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U. S. A.

GARDNER

precision disc grinders

134M

- **SALES ENGINEERING** . . . engineers and production men draw on extensive experience and up-to-date knowledge to recommend money-making lathe techniques, backed up with production and cost estimates.
- **EXPERIMENTAL FACILITIES** . . . concentrated on new lathe and FLOTURN development proving "impossible" jobs can be done with time and money saved!
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- **DEMONSTRATION ROOM** . . . a big "showroom," with representative lathes, where you can see your part turned on Lodge & Shipley Lathes or produced by FLOTURN, proving estimated time and cost figures.
- **TRAINING** . . . expert demonstrators are available to provide in-your-plant operator training.
- **MANUALS** . . . exceptionally complete operator's manuals minutely detail every step in the proper installation and operation of your Lodge & Shipley Lathes.
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- **LITERATURE** . . . objective-type bulletins on all Lodge & Shipley Lathes plus a long series of case histories detailing results.

Here's help in doing lathe jobs better, faster and at lower cost! A wide range of valuable services—many of them free—all designed to help the lathe user solve his production problems. For more information without obligation on any of the above services, write today to:

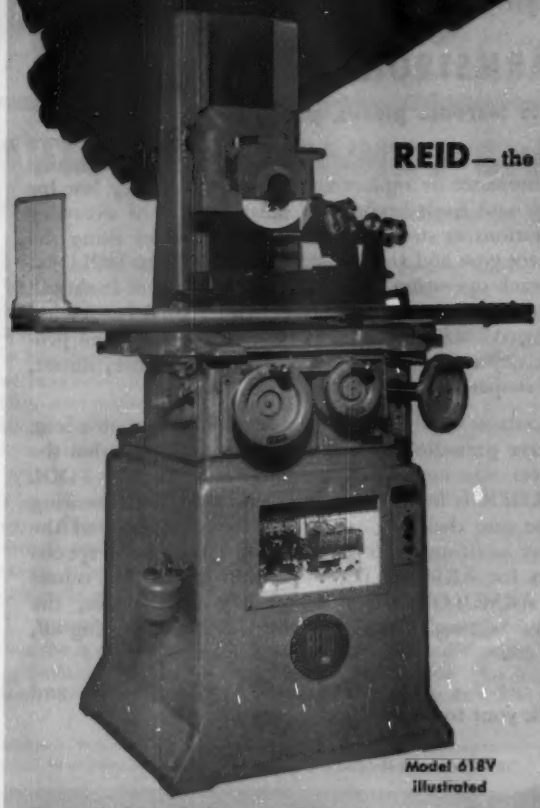
THE Lodge & Shipley COMPANY 3055 Colerain Ave., Cincinnati 25, Ohio.

CAN YOUR SURFACE GRINDERS MEET TODAY'S DEMANDS?

Many over-age surface grinders now being used simply cannot measure up to the precision tooling needs of modern, efficient plants.
If you're operating one of these over-age grinders it's time you changed grinders.

PLAN NOW FOR REPLACEMENT with REID GRINDERS

REID— the choice of industry for precision grinding



Model 618V illustrated

EASIER OPERATION

. . . finger-tip level controls eliminate stretching and bending, lessen operator fatigue. And, electrical controls are fully visible, yet protected behind a transparent shatter-proof panel.

BETTER SURFACE FINISHES

. . . hand scraped ways for smooth running; a motorized spindle turning on pre-loaded bearings, to eliminate wheel chatter, produce ground pieces with visibly finer surface finish.

RUGGED DESIGN

. . . all mechanical units built around rugged one-piece column casting to insure permanent alignment of cross-slide saddleways and vertical headways. Column is mounted on heavy cast iron base for maximum rigidity and freedom from vibration.

ECONOMICAL

. . . in both *initial* cost, and continued, trouble-free operation, Reid grinders are quality engineered throughout to provide accuracy and dependability.

CAPACITY

. . . 6" x 18" x 17¼" (from center of spindle to worktable). Choice of four models: either hand feed table, or power feed table with speed variable from 12 to 35 feet per minute. Complete accessories for wet or dry grinding and special operations are available.

Be ready for today's competition and a profitable future —

with **REID GRINDERS**

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Please request Catalog 618-1A

Reid Brothers Company, Inc.

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ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

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"THE TOOL HOLDER PEOPLE"

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Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

AUTOMATIC LOADING GIVES PRODUCTION A BIG LIFT

Simplimatic lathe gets "Automation" assist

It wasn't the machining job itself. That's done with speed and precision on the Gisholt Simplimatic Automatic Lathe. But the real trick was getting the big, heavy workpieces on and off the machine. Slow, awkward handling was penalizing production. So this special handling equipment was devised.

The same basic tool setup is used to machine six different sizes of motor frames—with tools on two vertical slide housings doing finish facing, boring and chamfering at both ends of the housings.

push-button loading

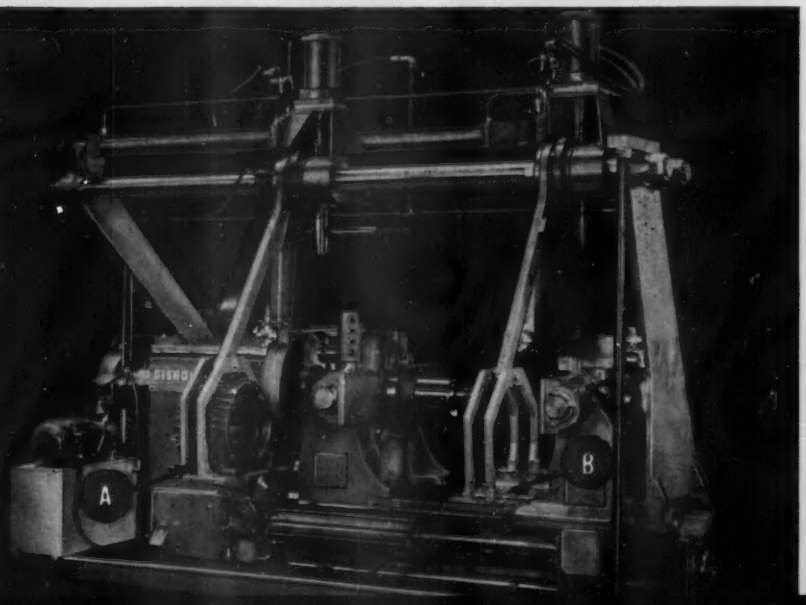
Note the special loading and unloading device. It works this way: Motor frames are slid from a conveyor onto loading cradle "A." At the push of a button, the frame swings in between the vertical slide housings and then moves longitudinally until it is over the expanding-type arbor, ready for chucking. A manually-moved locating stop positions the frame. After chucking, the loading cradle retracts, permitting the outer vertical slide housing to move in and support the mandrel during machining.

While the Simplimatic goes through its automatic cycle, the operator readies another part by re-loading the cradle. Unloading of the machined part is handled by the second cradle "B" which swings in between the housings and takes the frame as the mandrel releases. Floor to floor time for the largest frame is 3.5 minutes.

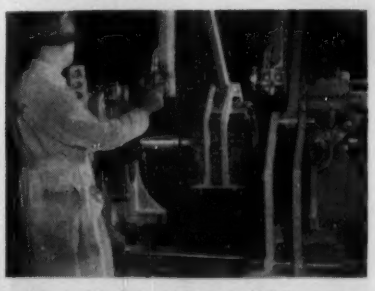
Changeover is fast. Removable guide rails are used in the cradles for locating and loading the frames. Different bore sizes are accommodated by removable shoe segments on the expanding mandrel. A crank arrangement repositions the outer slide housing for different frame sizes. Tool slides have micrometer-type adjustment screws with dial indicators for fast, accurate tool setting.

Faster loading and unloading of heavy parts with this special device increase productive time of the Simplimatic, lessen operator fatigue, cut costs. It is another example of the trend towards "automation."

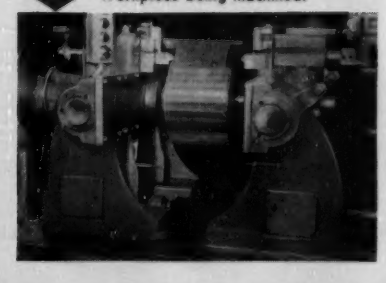
Simplimatic Automatic Lathe with overhead-mounted hydraulic-operated loading/unloading device. Workpiece loads at cradle "A" and is unloaded on cradle "B."



Operator pushes button to start loading cradle into position to chuck part.



Workpiece being machined.

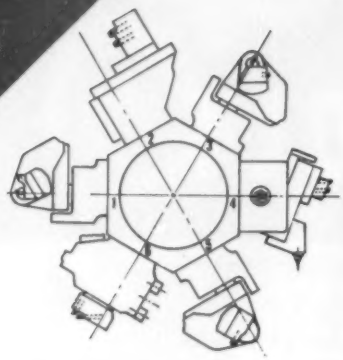


GISHOLT

TIME-SAVING IDEAS

SINGLE-TOOL WORK PUT "ON THE DOUBLE"

Unique Fastermatic setup generates radii with swinging tools

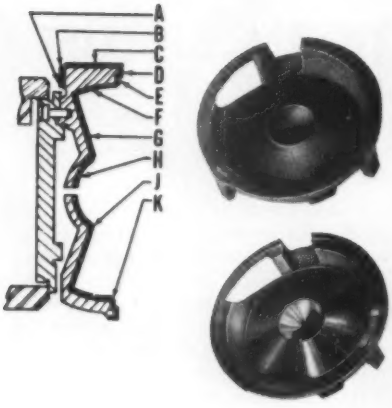


Only single-tool or generated cuts could achieve the accuracy and finish required for the seat faces and snap-fit diameters on these parts for water meter chambers. Note how the problem is solved by two Gisholt 1F Fastermatic Automatic Turret Lathes with a unique tooling setup. Nickel-iron workpieces come to the machines with reverse sides machined, drilled and bolted on chucking plates.

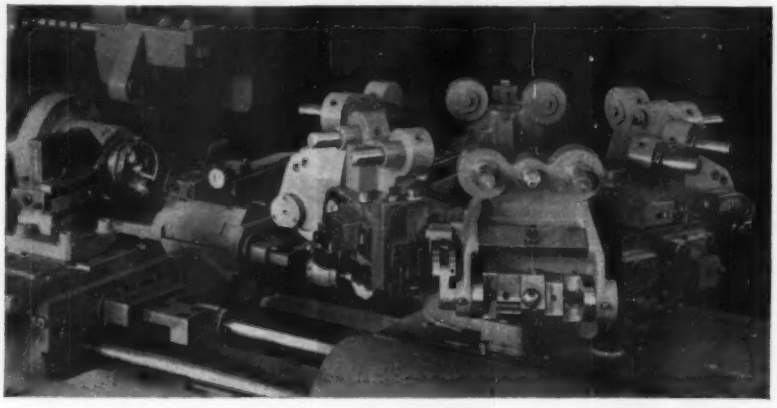
Here's the operational sequence:

Turret 1—Generate radii F and H.
Turret 2—Rough and finish turn C.
Turret 3—Burnish radius H and break corner K.
Turret 4—Finish face G and chamfer J with angular mounted slide tool and turret facing attachment.
Turret 5—Finish generate radius F.
Turret 6—Finish face D and E.
Front C/S—(Not shown on drawing)—Finish face A, semifinish face D and chamfer B.

One man and two Fastermatics with single-point tooling produce 320 parts per 8-hour day with this novel setup—12% better output than former way.



Special radius generating tooling on hexagon turret stations.



BALANCING AND CORRECTION COMBINED IN ONE HANDLING

Built-in Drill Spindle Speeds Output of Gisholt DYNETRIC Balancer

The design of the improved Gisholt 1SV1 Static Balancer easily permits the addition of correction equipment, such as drill spindles and welders. This makes production balancing simpler, faster and less expensive than ever.

Note how this well-known manufacturer is balancing flywheels. The cast iron parts are held on an expanding arbor and rotated. The operator notes the angle and amount of unbalance. The amount is indicated in terms of drill depth on the direct-reading meter located conveniently beside the work and the angular location is indicated by the number observed on a dial under a stroboscopic lamp.

Stopping the machine, the operator indexes the part for correction drilling at the location specified. Movement of the feed lever brings a thrust support under the workpiece and starts the drill. The vacuum chip remover comes down with the drill, removing the chips as they are formed. When the reading on the drill depth dial corresponds with the indicated amount of unbalance, the drilling is stopped.

In this efficient setup for measuring, locating and correcting unbalance in one chucking, output is at the rate of 53 parts per hour at 80% efficiency.

DYNETRIC BALANCERS GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION "DYNETRIC" IS A TRADE MARK AND U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

Ask for information on courses offered by *Gisholt Balancing School.*

GISHOLT

NEW PROFITS...MODERNIZE NOW!

GISHOLT

TIME-SAVING IDEAS

CONTOUR BORING ON FIXED CENTER TURRET LATHE?

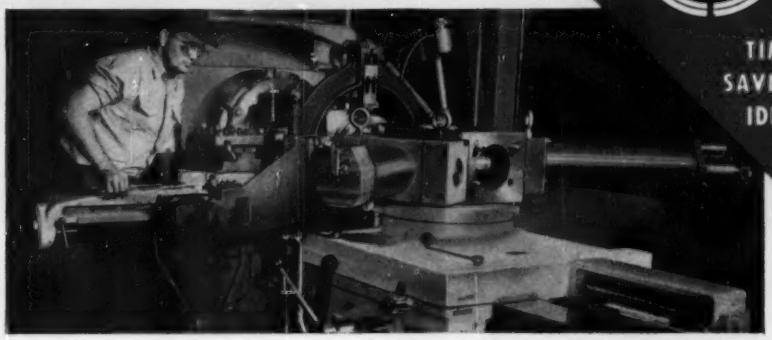
Special tooling and cam plate show the way

This workpiece is large, awkward and unwieldy. It's a gun recoil mechanism cradle assembly—28" long by 19½" in diameter.

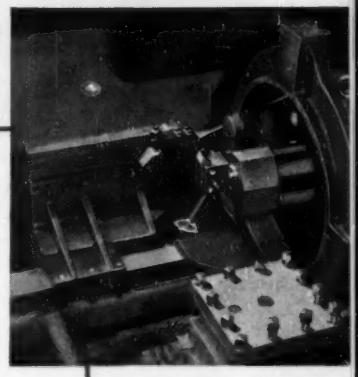
The job starts with the bore being chamfered from the square turret. A live center supports from the hexagon turret while square turret tools face the end and turn the O.D. Then a steadyrest is moved to support the part on the machined O.D. and the end is finish faced from the square turret.

Of special interest is the method for final contour boring achieved by a cam plate mounted on the rear bedway. A special trunnion, with one arm carrying the cam follower and the other carrying the boring bar and tool, pivots through the hexagon turret mounting. The boring tool alternately raises and lowers with the cam as the hexagon turret carriage feeds in toward the headstock.

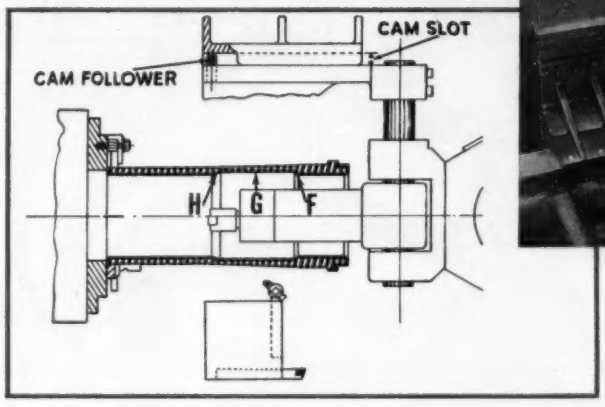
In this novel setup, accurate contour boring is easily accomplished by a cam-guided tool on this fixed center hexagon turret lathe.



Close-up shows angle plate on bedway and cam arrangement for guiding boring bar on fixed center turret lathe.

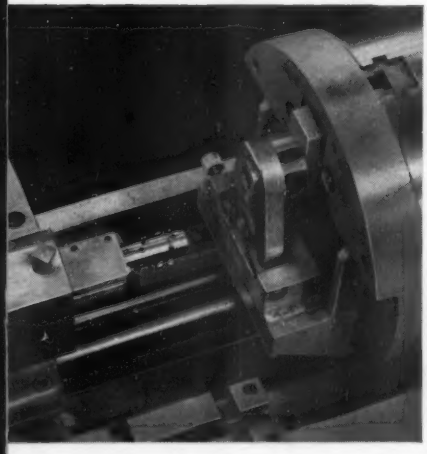


Contour F-G-H handled with special cam attachment. Other surfaces machined in conventional manner.



A FIRST-RATE JOB OF HOLDING AND MACHINING

Quick Changeover for Five Sizes Keynotes No. 12 Hydraulic Job

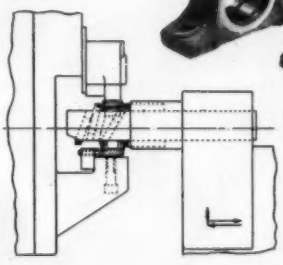


Single floating jaw in counter-balanced chucking fixture works for five sizes.

How to set up for simple, speedy machining and changeover for various size parts is nicely illustrated here.

This Gisholt No. 12 Hydraulic Automatic Lathe handles all production requirements for five sizes of cast iron pillow blocks. Holding is provided for by a special fixture mounted in a standard 3-jaw air chuck. Clamping pressure is applied to the feet, thus eliminating any distortion.

A single boring bar held in the front carriage does rough and finish boring and chamfering with longitudinal movement and then straddle faces, cuts snap ring grooves and chamfers with transverse movement. No tool marks left in the bore this way. Part sizes vary from 1.378" to 2.440" in the bore and time ranges from 1.3 to 1.9 minutes f.t.f.



Changeover is simple. For tooling, a new boring bar is added. For chucking, the centerline is changed with a riser plate. That's all there is to it.

A good example of how rough and finish machining of various size parts is speeded with separately tooled, easily changed boring bars.

GISHOLT

TALK TO GISHOLT ABOUT MACHINE TOOL LEASING

TIME-SAVING IDEAS

3-IN-1 SETUP SAVES EXTRA OPERATIONS

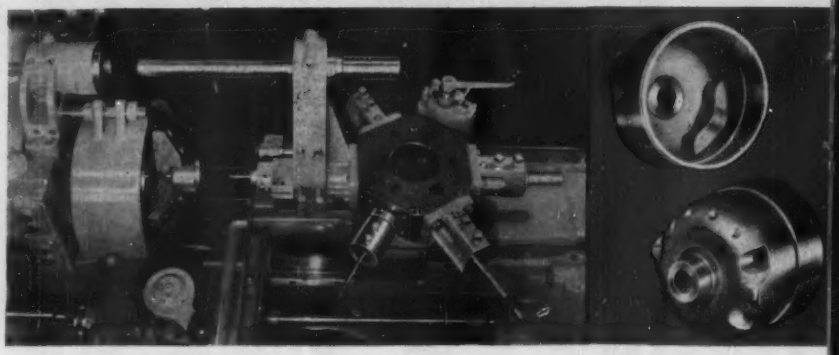
Machining, Broaching, Pressing Done on One Machine

Whenever you can combine three operations in one, you're time and money ahead. One such "how-to-do-it" is illustrated here... in the production of these fractional horsepower electric motor housings.

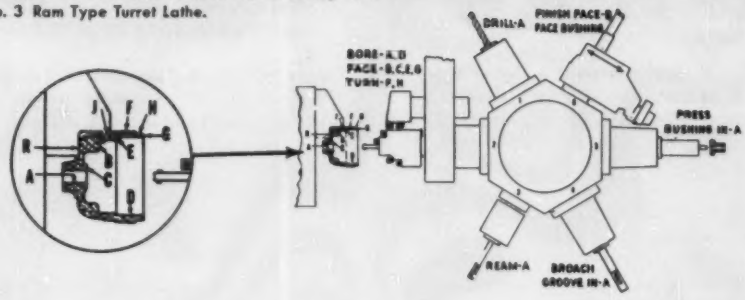
Instead of machining and then broaching a locking groove and then pressing in a bushing—as separate operations—this Gisholt No. 3 Ram Type Turret Lathe is expertly tooled to perform the *entire* job.

The layout shows how tools on the hexagon turret, in addition to standard machining, broach the groove and press in a bushing—all in one chucking. To complete the operation, the bushing and the housing are both finish faced from the last hexagon turret face. Time is only 1.37 minutes.

By skillfully doubling up operations on one machine, this producer eliminated a great deal of rehandling, saved real time and money in production.

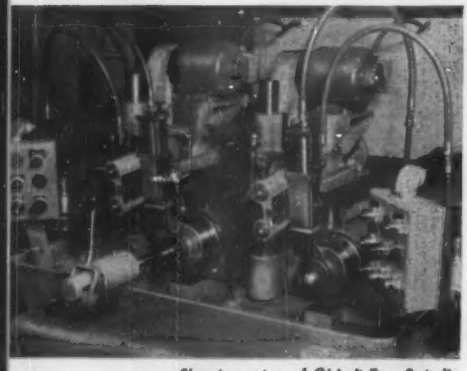


One machine does work of three with this setup on a No. 3 Ram Type Turret Lathe.



PARTS SUPERFINISHED AT RATE OF 140 PER HOUR

One operator tends two-spindle machine



Showing setup of Gisholt Two-Spindle Superfinisher, with push-button control panels for each station.

This European manufacturer had the problem of Superfinishing four different transmission parts, including a gear and shaft assembly plus three similar gear parts as shown. The requirement was for high production and, naturally, for the most economical method.

The practical solution was worked out by Gisholt engineers using this No. 54 Two-Spindle High Production Superfinisher. Since both stations have a fully automatic machine cycle, only one operator is needed to load and unload parts, alternating between stations. Note that each station has its own separate push-button control panel so that after loading, the operator merely engages the cycle start button.

The left-hand spindle station is in continuous production on gear and shaft assemblies. The right-hand station has tooling setup changes for the 3 other gear parts. On all workpieces, Superfinish is performed on a 7 degree tapered surface on the backrim I.D. Surface reading of from 25 to 30 micro-inches is reduced by Superfinishing to 4 micro-inches or less. With floor-to-floor time of only 35 seconds per part, total production is 140 parts per hour at 80% efficiency.

With this high-production setup, one machine and one operator handle a variety of parts to easily meet production requirements—and with real economy.

Arrows indicate surfaces Superfinished on transmission gear parts.

No. 11-1254

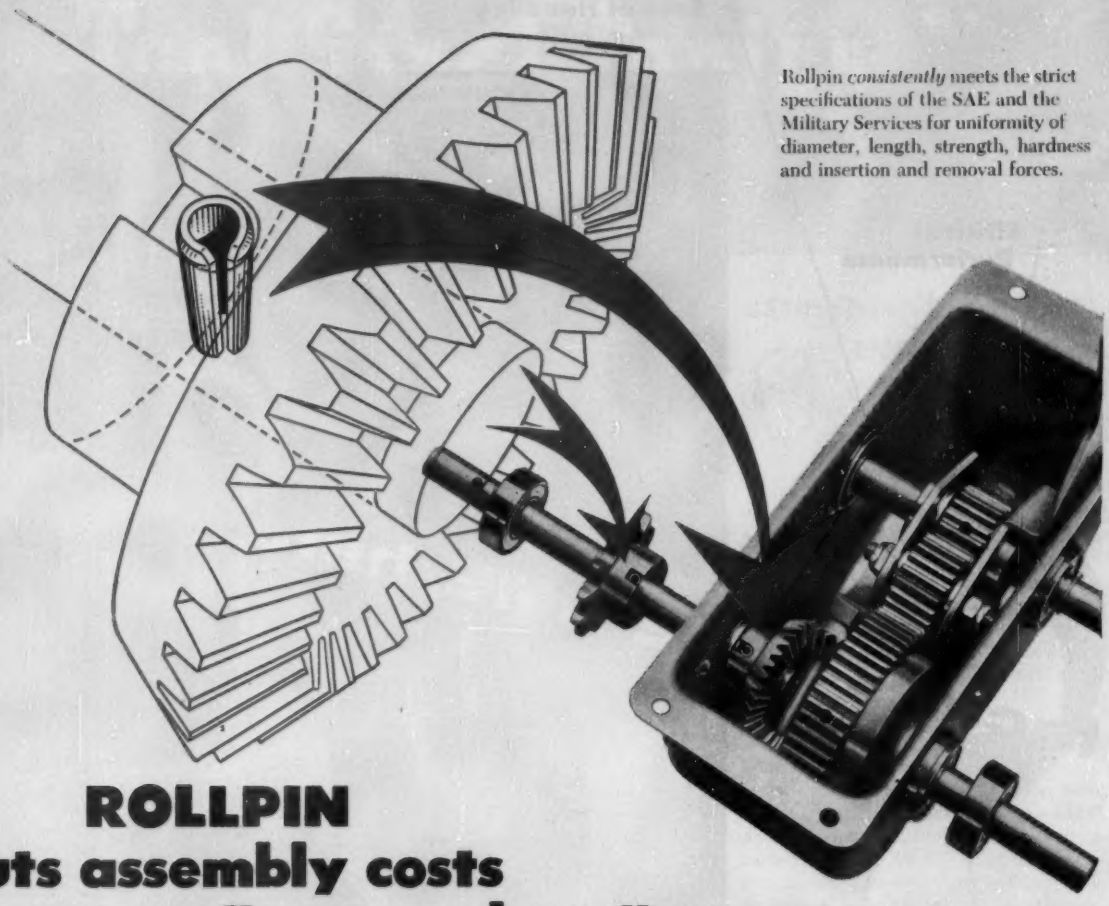
631

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Rollpin *consistently* meets the strict specifications of the SAE and the Military Services for uniformity of diameter, length, strength, hardness and insertion and removal forces.

ROLLPIN cuts assembly costs on new "acre an hour" power mower

. . . and solves tough vibration problem!

No extra parts—fewer assembly operations—better performance under vibration! Western Tool & Stamping gained these advantages by switching to Rollpin fasteners for its popular new Homko mower.

WT&S uses Rollpin fasteners in the transmission gear assembly, in the two jackshaft bracket assemblies, and in the extension bar that connects power unit to mower assembly. Why? Because, with Rollpin, there's no precision drilling, threading, or peening. And there's no need for cotter pins or other locking devices.

Rollpin is a slotted, tubular steel spring pin with chamfered ends that drive easily into standard holes, compressing as driven. Its spring action locks it in place despite severe vibration, impact loading, or stress reversals. Rollpin is readily removable and can be re-used in the same hole.

Mail the coupon for information on how Rollpin can do your fastening jobs faster and more economically.

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. R31-129, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

☐ Rollpin samples
☐ Rollpin bulletin
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

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Ease of Handling

Efficient Performance

4 factors SAVE TIME, here

Photo courtesy of The Peck, Stow & Wilcox Company, Southington, Conn.

Minimum of "Down Time"

No Operator Fatigue

The Peck, Stow & Wilcox Company point out that the general performance, handling, along with reduced operator fatigue and a minimum of down time of this modern Cincinnati Bickford Super Service Radial Drill effected a 20% time saving in their shop.

The illustration shows the drilling of housings for the Pexto Power Shears. Each piece that formerly required 2 hours is now completed in 1½ hours.

Investigate Cincinnati Bickford Drilling machines, profit makers for 80 years.

Write for Bulletin R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

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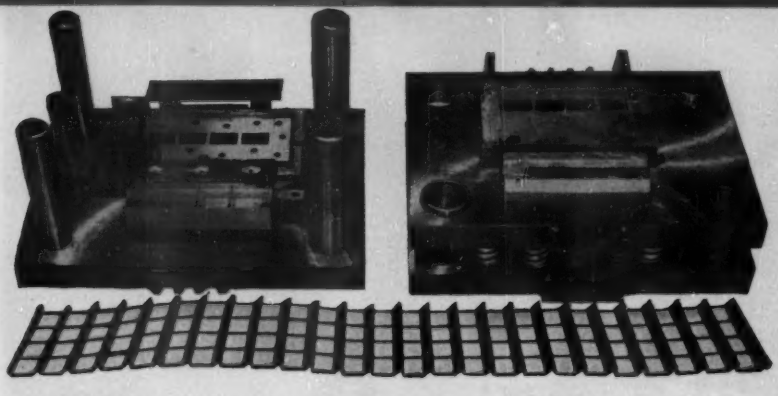
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation



Maker of Agricultural Machinery Gets Good Results With Lehigh H

The Gleaner Harvester Corp., Independence, Mo., has every reason to be proud of its revolutionary, self-propelled combine. For this mechanical marvel, with its centerline design, is a joy to behold as it takes large, continuous bites into blowing fields of grain.

Making parts for this practically human thresher and separator calls for some highly specialized dies made from outstanding tool steels. For example, the progressive die shown here, made of Bethlehem Lehigh H tool steel, produces the combine's straw rack (foreground). Operating in a 150-ton press, the die blanks and forms 22-gage galvanized sheet steel, about 50 strokes of the press being required to make each rack. The die is subjected to more than 20,000 strokes before inspection is required — ample proof of its durability.

Lehigh H is our high-carbon, high-chromium air-hardening tool-and-die steel. It's outstanding for long production runs because of its wear-resistance and toughness. Moreover, it offers minimum distortion during heat-treatment, plus the ability to harden deeply.

Lehigh H is safe-hardening. It is cooled in still air from a hardening temperature of 1850 F, and minimizes the cracking hazards of intricate dies, thin sections, and insufficient radii.

Your tool-steel distributor will be pleased to answer your questions about Lehigh H. He's always at your service.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Carburization of Tools Can Be Detrimental

Widely known are the beneficial effects obtained by intentionally carburizing some tools during heat-treatment. In general, wear-resistance of the surface is increased, while at the same time the shock-resistance of the core is maintained. But what is frequently overlooked is that carburized cases added unintentionally can be detrimental to service life.

Laboratory study of failed tools has shown this type of trouble often happens. For example: Rivet sets, failing from brittleness after short service, were found to have a carburized case; coining dies failed by splitting, due to a deep carburized case (0.030 in.); an extrusion punch shattered, due to an excessive carburized case (0.040 in.), containing 3.34 pct carbon.

Unintentional carburized cases commonly result from heat-treatment operations where there is improper control of atmosphere, such as "inert" packing material, "neutral" atmosphere in furnace, and "neutral" salt bath. All of these, of course, are actually carburizing.

The cure for this type of trouble is simple — don't put on a carburized case. Or if you do, be sure to grind it off later. On most tools the required dimensions will not permit grinding off an excessive case. So the practical solution is proper control of the heat-treatment.

High-Speed Tool Steel Cuts 35 Teeth in Bronze Worm Gear

This tangential cutter, fitted with an insert of Bethlehem 66 High-Speed Tool Steel, is shown cutting a tooth on a bronze worm gear. The gear is 74 in. in diameter and is 3-1/16 in. deep. It has 35 teeth, having a circular pitch of 6.25 in. With its excellent red-hardness, balanced abrasion and shock-resistance, Bethlehem 66 High-Speed is an ideal steel for difficult cutting jobs.

Cross Machine Control Unit— Key to Automation

A Mechanical Eye to Watch Your Tools

(U.S. Patent Nos. 2679038 and D-163935. Others Pending.)

The greatly increased number of tools used in modern transfer-type machines makes adequate tool control a "must." The Cross Machine Control Unit was developed to meet this need—to cut downtime by programming tool changes . . . to reduce tool expense.

The Cross Machine Control Unit is equipped with Toolometers which furnish a visual record of used and unused tool life and *automatically stop the machine when tools need changing.* Other tools almost used up are replaced at the same time. This grouping of changes, plus the availability of pre-set tools which are stored in the Machine Control Unit, reduces downtime. And downtime for machine adjustments and trial cuts is eliminated because standard fixtures and gages are provided for pre-setting the tools.

Over 300 Cross Machine Control Units now in use are evidence of cost saving benefits. Get full information today.

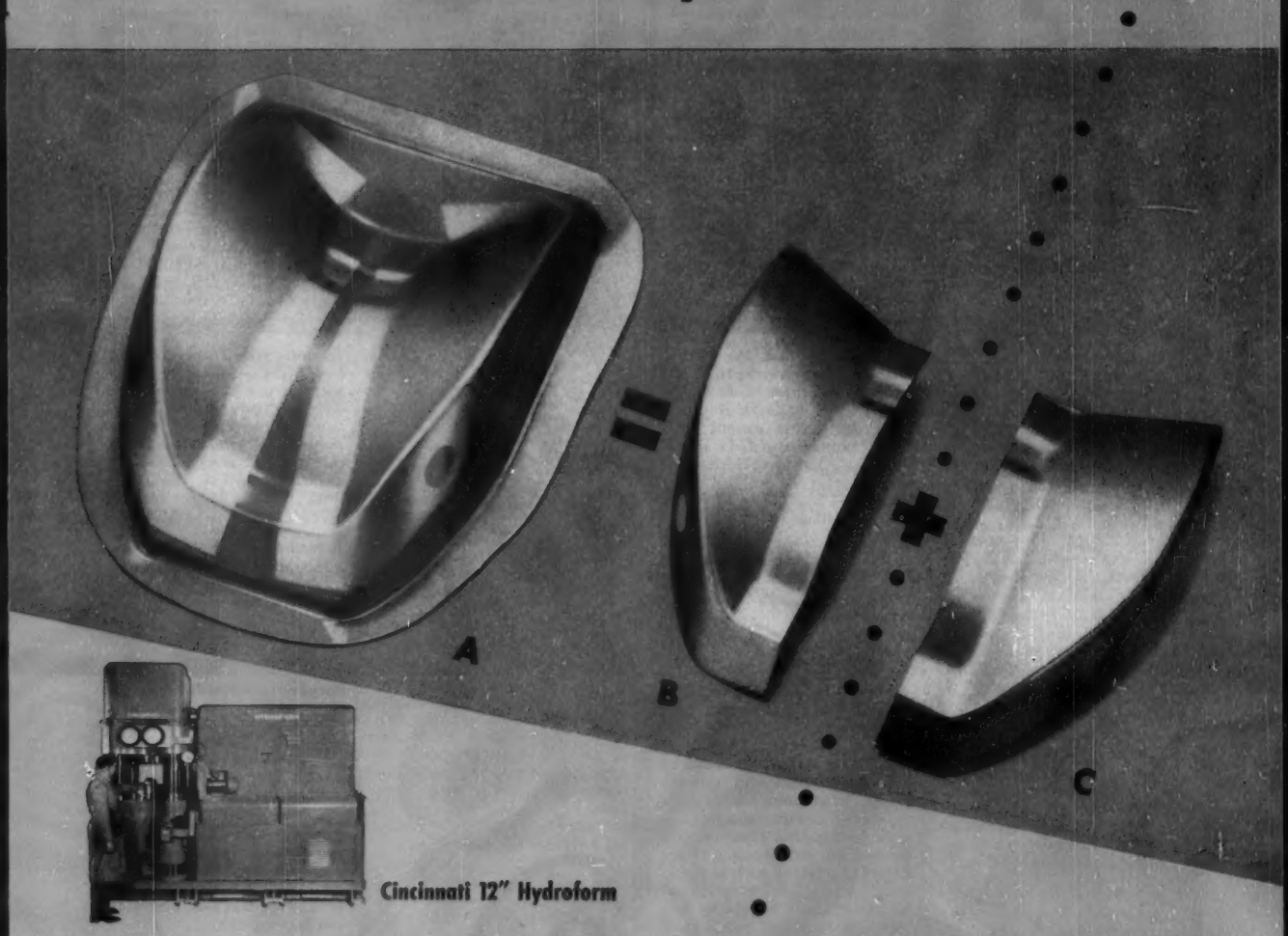
Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Tricky automotive part gets the Hydroform treatment



Cincinnati 12" Hydroform

With the help of the Cincinnati Hydroform, a supplier to the automobile industry has greatly simplified his production of complex-curved, right-hand and left-hand body structural components.

In the example illustrated above, shape "A" was accurately developed, then readily drawn on a 12" Hydroform from a 10¾" dia. blank of 20 gage cold rolled steel. (Note the extreme variations in contours.) Parts "B" and "C" were produced simply by sawing the parts out of the drawn shape. Shape "A" has been masked and paint sprayed, forming guide lines for sawing.

Tool costs were exceptionally low. The Hydroform punch was cast to shape in Kirksite. The draw ring was made from ordinary steel, with a band-sawed opening for the punch.

A similar Hydroforming procedure to that described above is being used successfully, with very substantial time and tool-cost savings, for the forming of duct sections for jet engines from heat-resisting materials.

Have you fully investigated the many Hydroforming advantages . . . and if Hydroforming can be profitably applied to your work? Let a Cincinnati Milling field engineer give you complete information. For a description of the Hydroforming process and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-3.

Hydroform

PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

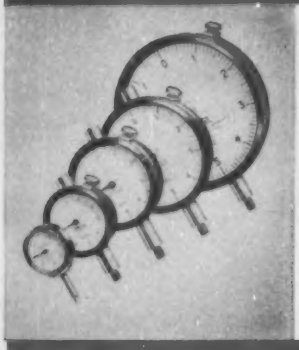
FEDERAL

You Get What You

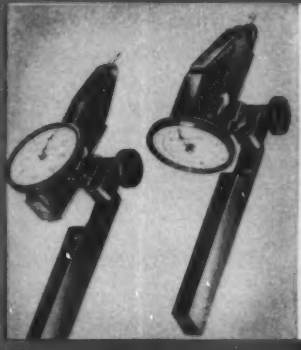
That's Only One Reason*

Basic Design Still Unsurpassed — Basically the same today as when first invented 37 years ago, the Federal Dial Indicator movement continues to outperform and outsell all others. The low friction movement, first introduced by Federal, is supported between massive plates; surpasses all later attempted innovations. Federal Dial Indicators are immediately sensitive, for inertia and friction are reduced to the minimum. Even the hand is dynamically balanced for greatest possible accuracy.

Wetproof Indicator — Completely sealed, this Wetproof Dial Indicator is fully protected from coolant, oil, oil fog and other liquid contaminants. Eliminates maintenance troubles under adverse operating conditions. Crystal is of glare-proof glass which is remarkably free of halations and will not discolor when exposed to oil or staining liquids. Regularly furnished with revolution counter and cushion movement. Available in "C" (2¼" O.D.) size and made to A.G.D. specifications.



Five Sizes to Suit Space and Visibility Requirements. Over Eighty Different Models Available — All Federal Regular Type Indicators except "A" Size, are made to A.G.D. specifications. The five sizes are respectively: A — 1¼", B — 1 11/16", C — 2¼", D — 2¾" and E — 3⅝" dia.



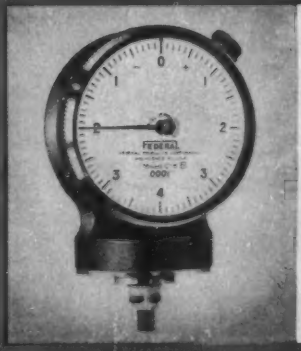
Testmasters — Universal Test Indicators — Federal's Testmasters are the most copied Test Indicators in both this country and abroad. But they surpass all attempts at imitation in *accuracy, durability* and *adaptability*. Graduated .001" and .0001" and in .0025MM and .01MM.

A Non-Magnetic Testmaster is a new item which is especially advantageous to use around magnetic chucks.

Graduations To Suit Tolerance — Dials in all Indicator sizes available graduated .00005", .00025", .0001", .0005", or .001", and Metric. Dials can be Balanced (plus and minus) Dials, graduated for regular tolerance comparison, or Continuous Reading (graduations numbered continuously) for direct measuring such as thickness, depth, etc. Continuous Reading Dials regularly furnished with Revolution Counter to facilitate reading total measurement. Special dials also furnished.

Perpendicular Indicators. Two Sizes, Seven Graduations — Specially adapted to fixtures where the movement of the contact point must be at right angles to the Dial. This Indicator is the first to use a crown gear movement to reduce friction to a minimum and is a smooth running, sensitive and very accurate instrument. Indicators of this type are available with Regular and Cushion Movements.

Cushion Movement Indicators — Federal offers a cushioned movement *optionally* on nearly all Regular Type Federal Dial Indicators. Many users prefer a directly geared movement where conditions require top accuracy. The Cushion Movement absorbs impact and prevents shock from reaching and damaging the small gear teeth, jewels, pivots and other parts. There is no increase in contact pressure or friction. Rigorous tests prove the exceptional stamina of this Movement.

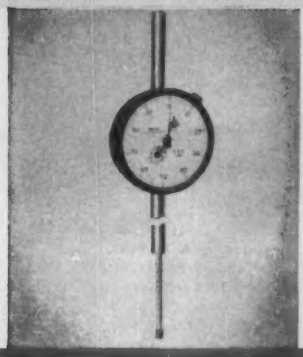


Super-Sensitive Indicators — All Bushing Friction Eliminated — The movement is entirely enclosed — dust and dirt cannot enter. All jewels are the highest grade carefully polished sapphire. Contact travel is limited to a short range for greatest accuracy, yet is sufficient for the precise measurements required of the Indicator. It is designed for those who desire the utmost in accuracy.

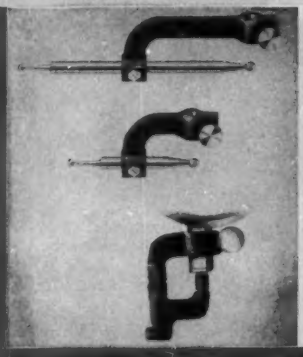
Dial Indicator, Air, Electric, or Electronic Gages — — for Inspecting,

Want From This Line

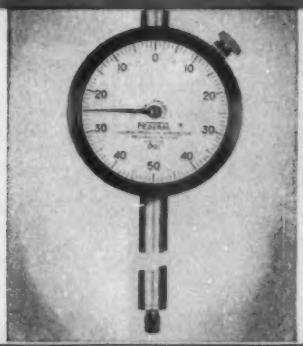
Why Federal Outsells All Others



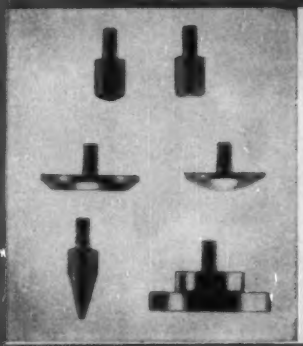
Long Range Indicators—These Federal Dial Indicators have longer ranges than the regular A.G.D. Models. They can be had in practically any length but those regularly provided have a range of .020" graduated .0001". And ranges of .100" and 2" graduated .001". All are 2¾" diam. or the regular "D" size Indicator. Revolution Counters are always furnished with Long Range Indicators to count off each revolution of the Indicator Hand.



Attachments — Hole Attachments facilitate testing internal and other surfaces inaccessible to the regular Indicator spindle. They fit Indicators with .275" or .375" stems. Right Angle Offset Attachment transfers motion at right angles to the Indicator spindle, directly to the Indicator. Arm is hinged by a flat spring, eliminating inaccuracies caused by wear or play in pivot-type bearings. This Attachment fits all Indicators with a .375" stem.



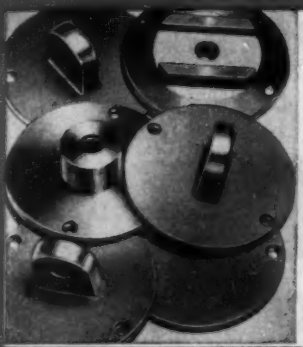
Long Stem Indicators—Recesses and similar places impossible to reach with regular Indicators are accessible to these Indicators. Stems of various lengths can be furnished to meet specific requirements. These Indicators are special and details of your requirements are needed with your order.



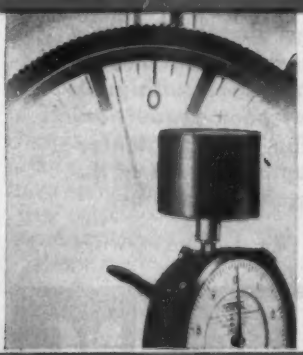
Contact Points — Federal Contact Points in any lengths varying by ⅛" are hardened steel and blackened to retard rusting. Several shapes and sizes are available. Wide Face Points of hardened and ground steel can be used when desired in place of Regular Contact Points. Special Points can also be furnished. Where Indicator Contacts are subject to excessive wear, Points can be furnished tipped with diamond, tungsten carbide, or hard chromium plate.

Lifting Lever — New, free acting. Does not affect the reading or accuracy of the Indicator and is furnished on regular bracket type back. Can be furnished to order on any other type of back. It can also be supplied separately assembled to a replacement back for use on existing "exposed" type Indicators.

Dust Guards — Keep out talc, dust, excessive oil, etc. Used on regular type points.



Backs — The Regular Type Back is standard with Federal Regular Type Indicators and is included in the price of the Indicator. Other Backs can also be furnished; with offset bracket, post bracket, screw bracket, adjustable bracket, and flat. Special Backs to meet customer's requirements can also be furnished to order.



Tolerance Hands — These Hands mark specified limits of any dimension. They can be set independently by rotating the knurled bezels and clamped in position. They do not interfere with setting Dial.

Weights — Compressible materials such as rubber, paper, textiles, etc., should be measured under constant pressure (not spring loaded). Federal provides weights, to conform with technical society standards. Pressure is directly through the rack spindle to the contact point.

Ask **FEDERAL** ***FOR ANYTHING IN DIMENSIONAL DIAL INDICATORS.*** **— If necessary, we could readily provide over a thousand combinations of our existing gears to make Federal Dial Indicators having every imaginable range and graduation. It's the most extensive line of Dimensional Dial Indicators in the world. Ask for your copy of the Federal catalog showing this most complete line.**

FEDERAL PRODUCTS CORPORATION
4112 Eddy Street • Providence 1, R. I.

*Watch for other reasons in later advertisements.

Measuring, Sorting, or Automatically Controlling Dimensions on Machines.

"It costs Less to DO IT RIGHT . . . . . than to DO IT OVER"

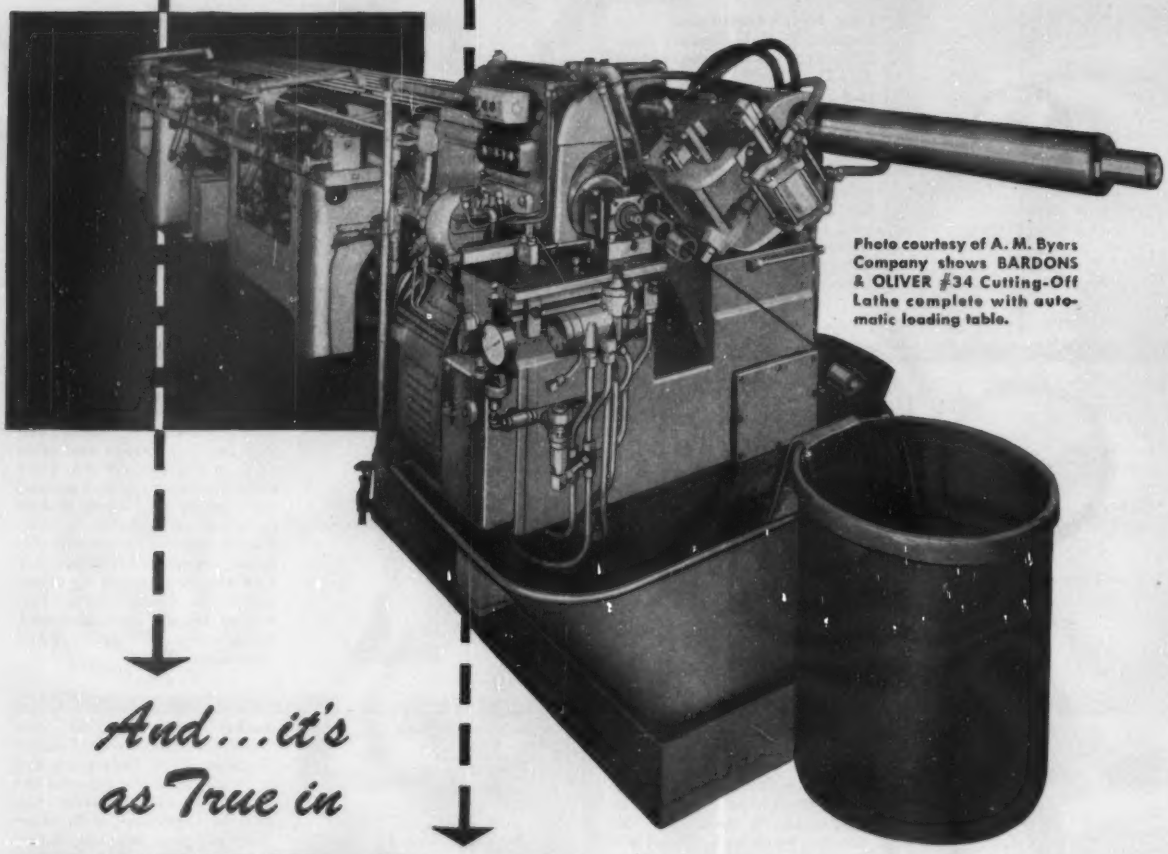


Photo courtesy of A. M. Byers Company shows BARDONS & OLIVER #34 Cutting-Off Lathe complete with automatic loading table.

And . . . it's as True in

BYERS

WROUGHT IRON PIPE

as it is with

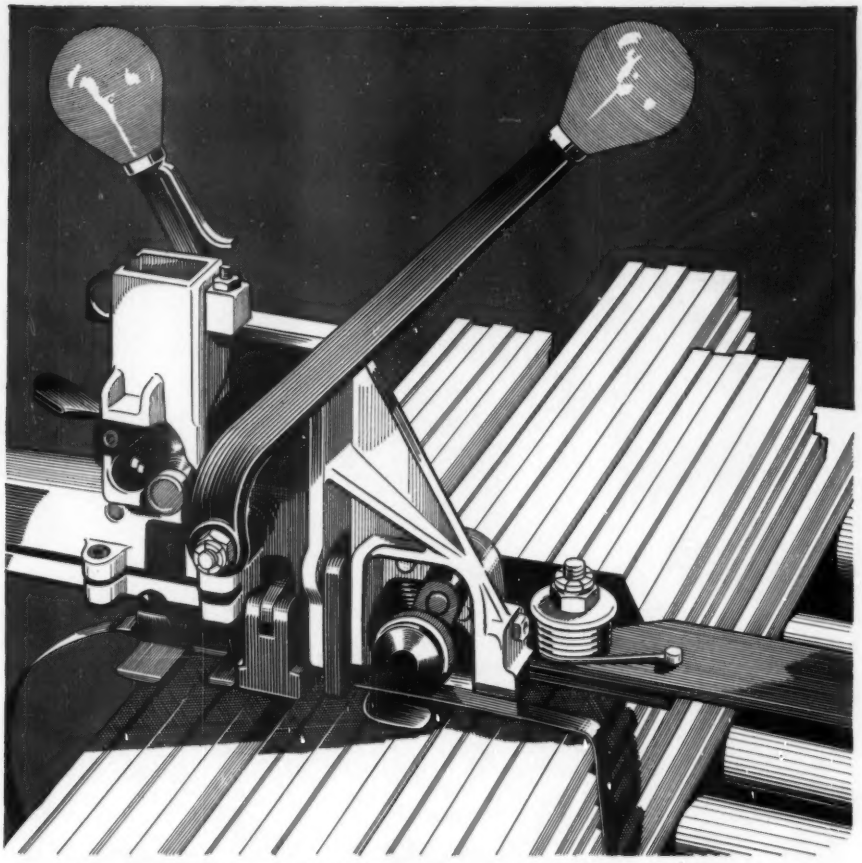
BARDONS & OLIVER

CUT-OFF LATHES

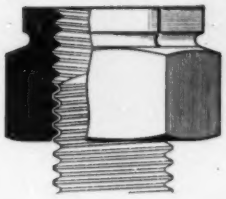
"It costs less to *do it right* . . . than to *do it over*" is the famous slogan of A. M. BYERS COMPANY, America's oldest and largest manufacturers of wrought iron pipe and tubular products . . . and they *practice what they preach* in the selection of BARDONS & OLIVER Cutting-Off Lathes. The folks at Byers are well aware of the advantages in buying *QUALITY* machines for lasting service. The quality built into every BARDONS & OLIVER Cutting-Off Lathe means years of accurate, dependable operation with peak production, and . . . speaking of peak production, the A. M. Byers Company is cutting-off and chamfering 1¼" Wrought Iron Pipe Coupling Blanks at the rate of 900 per hour . . . a real production bonus.

BARDONS & OLIVER, INC.

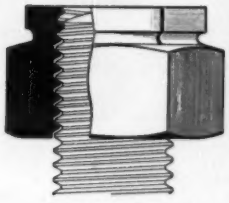
1134 WEST 9TH STREET • CLEVELAND 13, OHIO



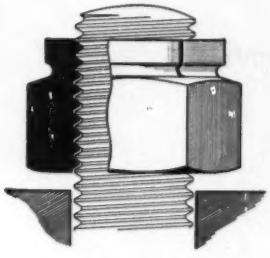
Wherever assemblies must be held together—on metal strappers or dishwashers—more and more original equipment manufacturers and maintenance men are relying on FLEXLOC locknuts for safe, dependable locking.



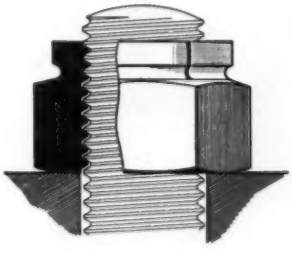
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

Why are more and more FLEXLOC locknuts being used to hold assemblies together?

There are a number of reasons. FLEXLOCS are one piece, all metal—no lockwashers to break, no cotter pins to shear, no auxiliary locking devices to deteriorate. FLEXLOCS stay put wherever you place them—as stop nuts or seated nuts—once their locking threads are fully engaged. Because they won't work loose, they reduce costly service calls. FLEXLOCS have higher tensile, are stronger than most other locknuts. And they withstand temperatures as high as 550°F.

FLEXLOCS have the additional advantage of reusability. They can be applied again and again without loss of efficiency. Because they are safe and dependable, you'll find more and more FLEXLOCS being used where vibration is severe—on automotive equipment, compressors, machine tools, household appliances, high-speed looms, aircraft.

FLEXLOCS are available in a wide range of sizes in any quantity. Stocks are carried by leading industrial distributors everywhere. Write for literature and samples for test purposes. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

Northern Pacific's Streamliner, Cocolalla Lake, Idaho

Shostal Press Agency Photo

BULLARD

The Invisible Background of Industrial Progress

Since the driving of the Golden Spike on May 10, 1869, linking the Central Pacific and Union Pacific Railroads, this mode of travel has been the lifeline of our commercial and industrial activities.

Railroads have kept pace with the needs of the nation by promoting more modern equipment and methods. Today's streamlined Diesels speed over the rails replacing steam locomotives. De luxe coach and Pullman cars, unknown a few years ago, now provide greater conveniences and luxuries for the traveler.

Railroads and manufacturers of railroad equipment have long recognized the importance of *Modern Machine Tools* in the efficient production of their products — evidence of "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY

Bullard Mult-Au-Matic
Type "K"–Available with
6 Spindles, 6 Twin Spindles,
8 Spindles and 8 Twin Spindles

The "Mult-Au-Matic Method" has gained acceptance throughout industry as a manufacturing method that has contributed greatly to the economic production system.

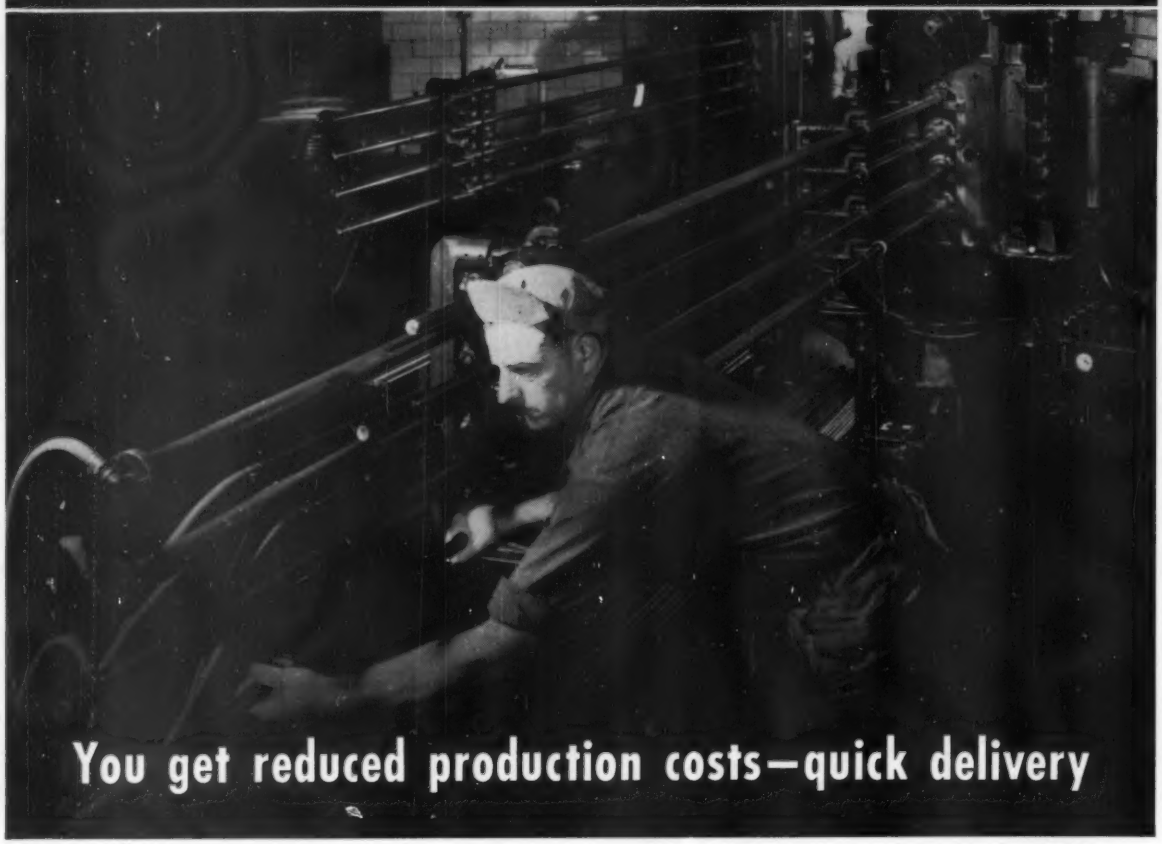
The Type "K" Mult-Au-Matic is engineered and built to increase the scope of the "Mult-Au-Matic Method" by reducing production costs on the small and medium-size jobs. Here are some of its features:

High spindle speeds
Independent and variable feeds for each tool head
Positive feed stops assure work accuracy
Power-operated chucking maintains cycle time
Twin spindle application for high production
Minimum floor space in relation to productive capacity.

These features can provide increased efficiency to your machining problems. A Bullard Sales Engineer will be pleased to discuss them with you. Reach him by calling the nearest Bullard Sales Office or write to The Bullard Company, Bridgeport 2, Connecticut — phone EDison 6-2511.

BRIDGEPORT 2, CONNECTICUT

WHY IT PAYS TO BUY MX SCREW STOCK FROM US



You get reduced production costs—quick delivery

● Hundreds of shop cases have shown that USS "MX" free-machining bar stock cuts unit costs considerably . . . an average of 10% to 15%, sometimes as high as 42%. And the more machine work your parts require, the greater the savings.

Here's how you cut costs when you use "MX" rather than other free-machining grades:

You get more parts per hour, longer tool life with less down time for grinding and adjustment, fewer rejects, closer tolerances and better part finish.

One of our qualified sales representatives will gladly discuss the advantages of "MX" with you as they apply to your particular shop requirements. And you can always depend upon quick delivery from the nearest U.S. Steel Supply warehouse.

In addition to "MX" stock, we carry: cold finished rounds, squares, hexagons, flats and precision shafting in all grades.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY

DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

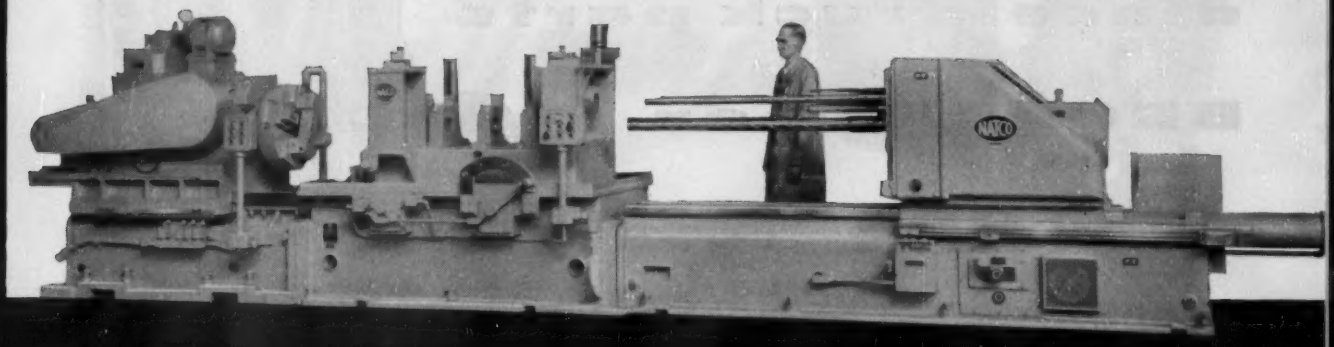
Warehouses and Sales Offices
Coast to Coast

USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

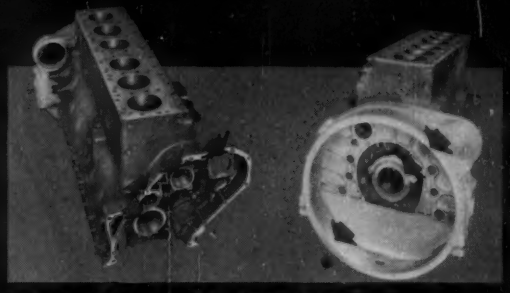
NEW NATCO BOREFACE

SPEEDY, PRECISION PRODUCTION CUTS DIESEL ENGINE BLOCK COSTS



CAM and CRANK FINISH BORING and FACING OPERATIONS DONE SIMULTANEOUSLY ON 4.3 PARTS PER HOUR AT 85% EFFICIENCY!

New NATCO BOREFACE machine, employing two heads, speeds production of diesel engine blocks by finish boring cam and crank holes and boring and cross-feed facing flywheel case simultaneously. The locations and diameters of the straight alignment bores are held to extremely close tolerances. The finished facing on the flywheel housing and cover is held square with the crankshaft bore to within .0025" total indicator reading. These tolerances are made possible by the built-in accuracy of the NATCO BOREFACE and because all operations are performed with one locating of the part.



RIGHT HAND HEAD OPERATIONS
Finish bore 7 (in-line) main bearings
Finish bore oil retainer and cover
Finish bore 4 (in-line) camshaft bearing inserts
Finish bore 2 holes

LEFT HAND HEAD OPERATIONS
Rough, semi-finish and finish bore and rough, semi-finish and finish cross-feed face flywheel housing and cover.

Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping

NATCO

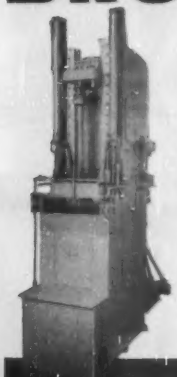
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

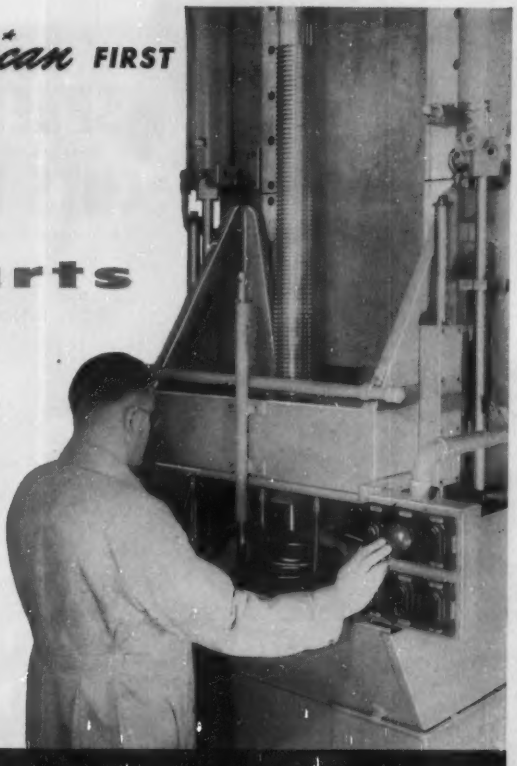
Branch Offices

CHICAGO, Room 202, 6429 W. North Ave., Oak Park • DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon

ANOTHER *American* FIRST

28 different diesel truck parts BROACHED on ONE MACHINE





★Machine utilizes three types of broaches — round, plain spline and combination round-and-spline.

★Interchangeable thrust bushings which adapt to a universal equalizing fixture.

★One to three station broaching depending on size and shape of part to be broached.

Here's an example of the flexibility of tooling American can build into a broaching machine to fill special requirements. Shown at left are some of the 28 different diesel truck parts a manufacturer is producing with the aid of an American vertical pull-up broaching machine. Note the variety in types of parts — broach lengths varied from 33 to 70 inches.

An added feature of this machine is a lower elevator follow-up during the first part of the broaching stroke providing greater back support and eliminating vibration.

Whether you need extreme versatility — with many parts broached by one machine, as in this example — or the high volume, low cost production resulting from completely automated broaching of single parts, American is prepared to serve you. American engineers and builds all three — broaching machines, broaches and broaching fixtures.

Let us work on your broaching problem.

Write for catalog 450 — the new and informative manual on American broaches, machines and fixtures.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

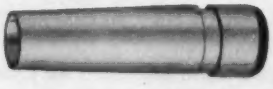
No. 4 in a Series

What's in it for you

Before you buy your next multiple spindle automatic bar machine it will pay to ask your Cone Representative about the Conomatic Carbide Development program. He will be glad to tell you what's in it for you.

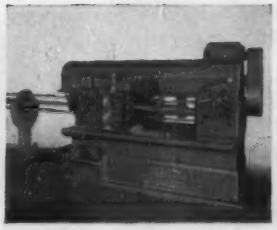
Among the things that your Representative can tell you is how you can be sure that any brand of "automatic", that you may have under consideration, will be equipp[illegible] to get the most from any modern tool material, including 100% carbide tipped tool applications.

The part illustrated is from regular production runs with HSS and 100% carbide tipped tools. Full particulars are available.



MATERIAL—COPPER: Hole drilled with ½" dia. drill to 3" depth; taper formed on OD.

	HSS	CARBIDE
Cycle Time	45 secs.	16 secs.
Work Spindle Speed	670 R.P.M. at 110 S.F.	2026 R.P.M. at 398 S.F.
Tool Wear	150 pcs. per grind	2500 pcs. per grind



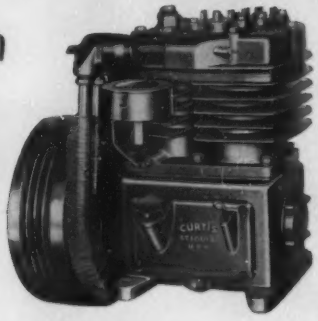
Conomatic}

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Curtis

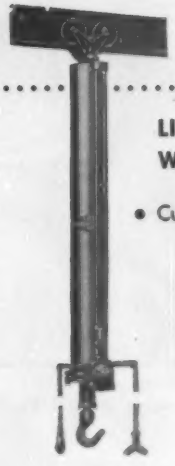
AIR COMPRESSORS, HOISTS and CYLINDERS

Cut Costs While Speeding Production



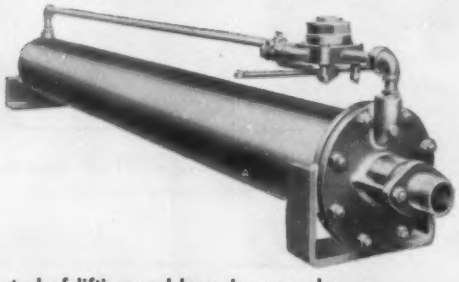
AIR TO DO INNUMERABLE JOBS AT LOWER COST WITH A PRECISION-BUILT CURTIS COMPRESSOR

- Timken roller main bearings equipped—easy external adjustment.
- Self-oiling—pressure lubricated rod bearings and piston pins.
- Air-cooled—no danger of freeze-ups.
- Tank Mounted Compressors ¼ H.P. through 15 H.P. (up to 78 cu. ft. displacement per minute)
  Simple Compressors ¼ H.P. through 50 H.P. (up to 300 cu. ft. displacement per minute).



LIFT OR LOWER LOADS QUICKLY WITH A CURTIS "ALL STEEL" AIR HOIST

- Cut costs with these time-saving, work-saving air-powered hoists.



PUSH IT, PULL IT, LIFT IT, LOWER IT WITH A CURTIS "ALL STEEL" AIR CYLINDER

- Curtis Bracketed Air Cylinders can work in any position from horizontal to vertical.
- Delicate control of lifting and lowering speeds.
- Cylinders ground and polished on inside diameter.
- They bring new time-saving ease where lifting, lowering, pulling or pushing is required.
- Valve is disc type. Returns automatically to neutral position when operating chains are released . . . and effectively hold the load.

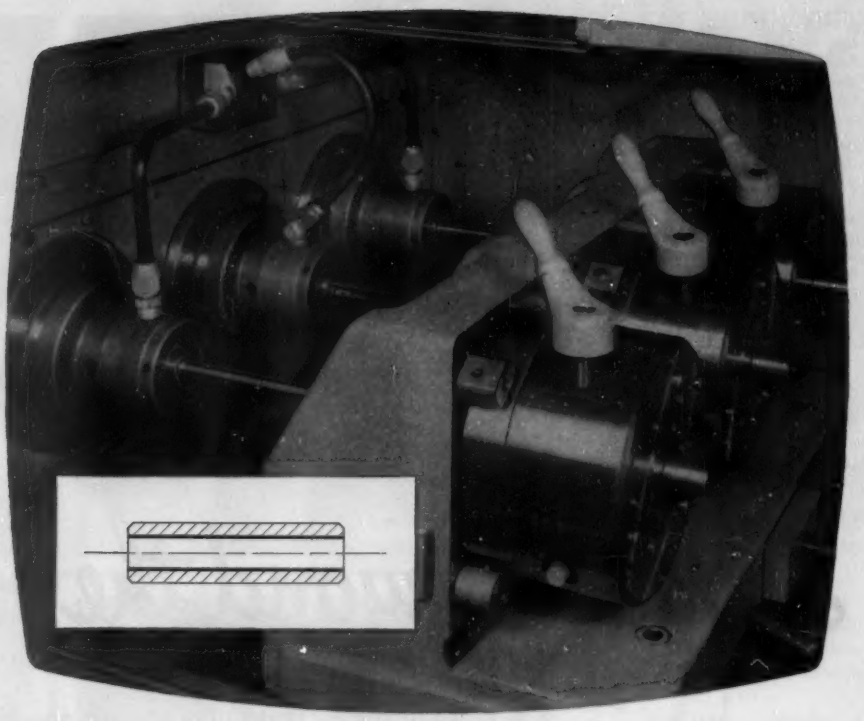
Get all the facts about cost-cutting Curtis equipment!

1854 **100** years 1954

Curtis PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue • St. Louis 20, Mo.

-806

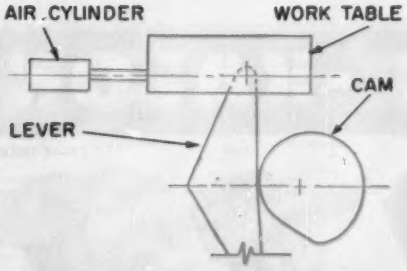
Get precision drilling results like this...



Part—Titanium alloy tube, 30 Rockwell "C"
Operation—Precision drill hole from solid
Hole dimensions—.450 + .010 dia. x 2 25/32" long
Cutting Speed—1168 R. P. M., 160 S. F. M.
Feed—.701 P. M., Lead: .0006
Finish required—75 micro-inches or better
Production—40 pieces per hour at 100%

... on the BRYANT precision boring machine!

This Bryant Boring Machine, plus years of Bryant research, opens up new possibilities for you in precision boring, drilling, turning, facing, grooving and contour boring and turning. It enables you to produce uniform fine finishes ... at peak production rates ... with highest repetitive accuracy.



The basic rigid machine design, and research-proven tooling and fixtures, make the Bryant 998 ideal for precision drilling techniques. The table is actuated mechanically by a precision cam and lever unit. This feature provides positive control of the cycle at all times and eliminates variation due to temperature change of a hydraulic system. Fine finishes are assured by the smooth, uniform table motion. The table moves on two 4"-diameter solid steel slide bars firmly bolted to the bed. Two anti-friction, preloaded ball bearings on each of these bars support the table. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

BRYANT chucking grinder co.
SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

More than meets the eye

P-K Socket Screws, at a glance, may look substantially like the make you buy through habit. It's easy to conclude that all such fasteners are simply "screws with hex sockets." You have to "look beyond the hex" for the difference.

If you don't, you are buying with a "blind spot" that blocks your way to *proved* benefits other buyers use to advantage.

Parker-Kalon's exacting Quality Control is only one of the advantages you don't see until you "look beyond the hex."

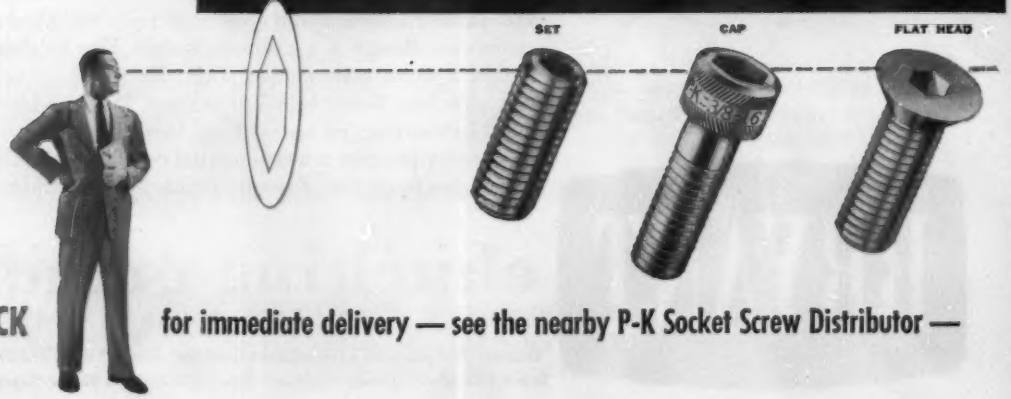
Look Beyond the Hex——

Compare every detail of product and service. Compare for advanced design that speeds assembly . . . for proved assembly strength. Compare planning and buying aids, and supply service. Get all the facts, and try P-K Socket Screws. You'll find they take top rating in every test.

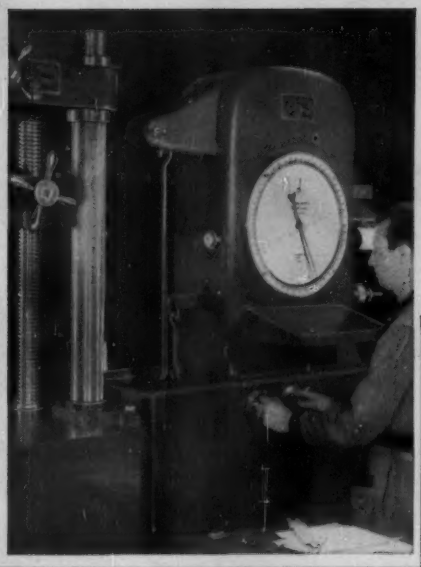
For cost-wise assembly, you need all the advantages offered only by P-K. Why miss any of them? Get samples, information from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

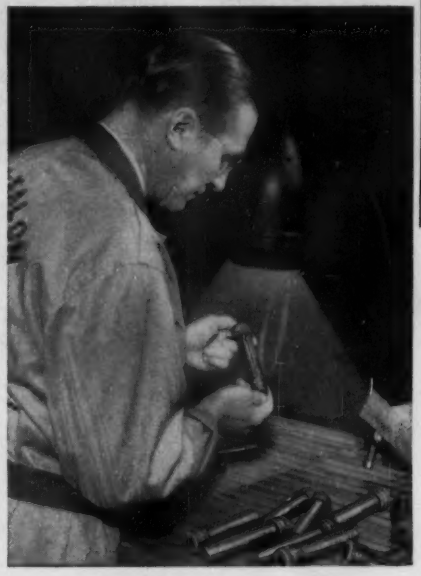
for Guaranteed Quality gaged to most exacting needs

PARKER-KALON®



IN STOCK for immediate delivery — see the nearby P-K Socket Screw Distributor —





P-K QUALITY CONTROL

begins with tests of all wire — continues through visual screening of *all* screws. The finest apparatus aids skilled senses of technicians and inspectors, no defect escapes detection.

Four of the many steps in the exacting routine are illustrated at the left. Above, the metallograph test to check metal structure, and the test to determine ductility and strength under tension loads. Below, the pilot furnace for testing heat-treatment procedures, and the Magnaflux inspection, employing "black light" to reveal any defects.

FOR ADVANCED DESIGN that speeds assemblies — makes them simpler, stronger — and saves errors.

FOR ASSEMBLY STRENGTH okayed in a million punishing tests by thousands of satisfied users.

FOR PLANNING AIDS and buying data patterned to your special needs, plus advice on assembly.

FOR SUPPLY SERVICE set up for fast action and lower purchasing expense — by local Distributors.

FOR ANY STYLE OR SIZE You'll find any Socket Screw you need in P-K's complete line. Hex Keys in all sizes, and several handy sets.

GET **ALL**
THESE ESSENTIALS OF
COST-WISE ASSEMBLY
GET **P-K**

SOCKET SCREWS

BUTTON HEAD SHOULDER PIPE PLUGS HEX KEYS

your local Supply and Service Specialist

Two words that mean THE LAST WORD in the design and manufacture of taps:

BALANCED Action

All Winter Taps—standard or special—are BALANCED ACTION TAPS. They give you size control and maximum tool life.

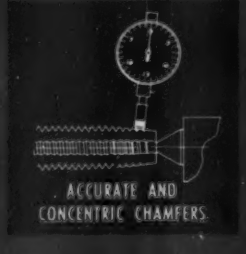
CALL YOUR WINTER DISTRIBUTOR

Your local Industrial Supply Distributor carries a complete stock of WINTER Balanced Action Taps.

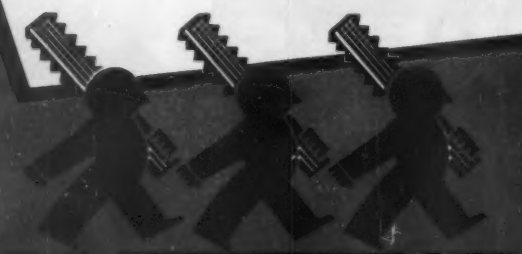
EXACT FLUTE SPACING

UNIFORM FLUTE CONTOURS

PRECISION CHIP DRIVER CONTOURS



ACCURATE AND CONCENTRIC CHAMFERS



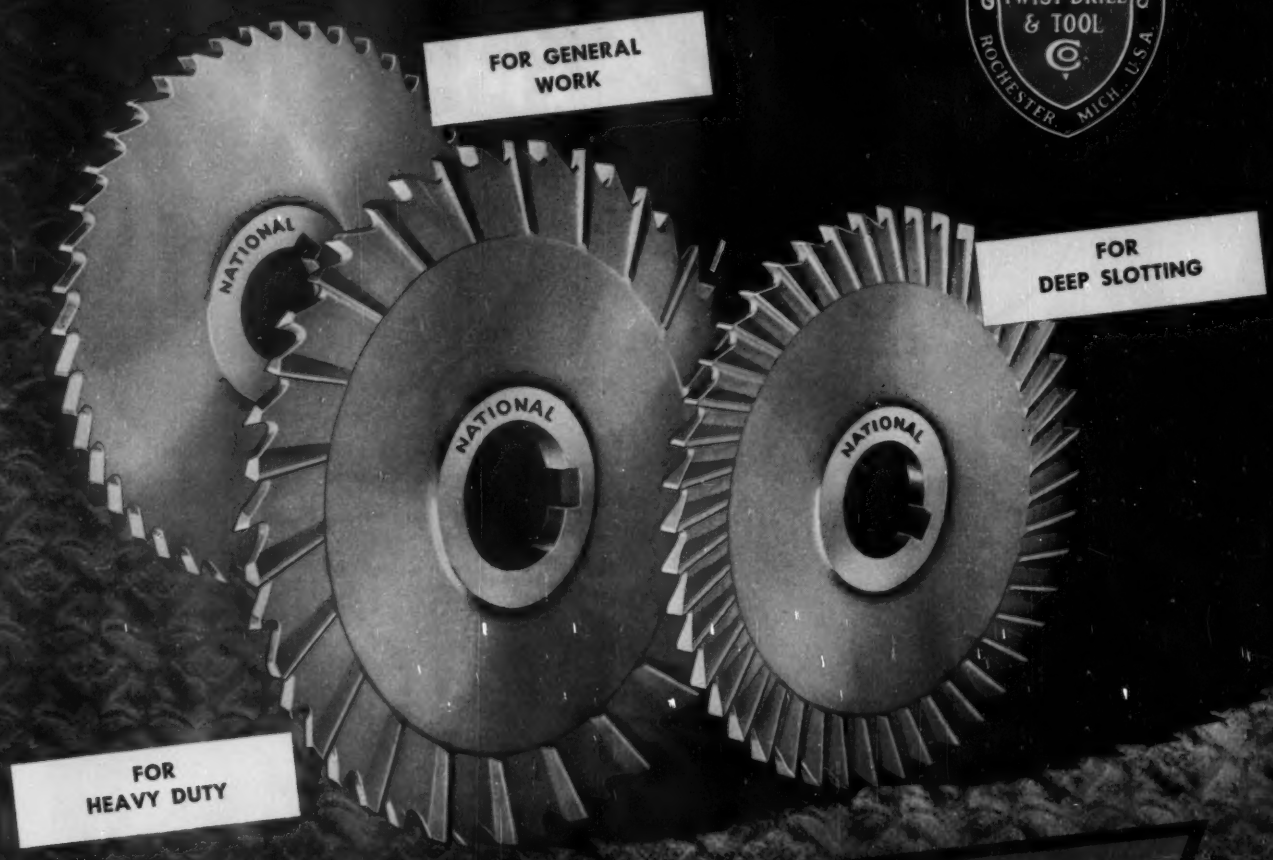
WINTER

WINTER BROTHERS COMPANY
Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York · Detroit · Chicago · Dallas · San Francisco · Los Angeles
Division of National Twist Drill & Tool Co.

National

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.



For sawing and slotting . . . use NATIONAL CUTTING EDGES

Get the Saw with the bite that fits your job. You'll find it in the National line. All are designed to minimize fine chips and dust. No binding—no scoring.

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U. S. A. Distributors in principal cities. Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs and Special Tools.

Colonial "SUBTRACTING" machines

they subtract production costs ... add to profits

Subtraction #1—the *Broach.* With the Colonial broach designed specifically to broach the part efficiently to the tolerances specified at the required rate of production, cost subtraction starts.

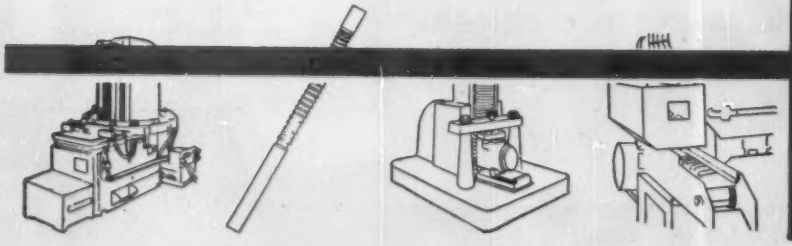
Subtraction #2—the *Machine.* Selecting one of the more than 60 dependable Colonial broaching machines capable of handling the broach at the specified rate of production is the next important step in subtracting costs.

Subtraction #3—the *Fixture.* The Colonial fixture, locating and clamping the part in broaching position, while at the same time permitting maximum accessibility for loading and unloading, is another important step in cost subtraction.

Subtraction #4—the *Automation.* Where high production requirements make loading and unloading time an important factor, the Colonial automation of the broaching installation will serve to further subtract machining costs.

ADDITION—By adding the four important Colonial cost subtracting features above, today's cost conscious metalworking plant has a complete *Colonial Unified Broaching Installation* capable of producing the part at lowest possible cost with utmost accuracy. To subtract costs and add to profits in your plant, ask Colonial Broach to quote on Unified Broaching installations for your parts.

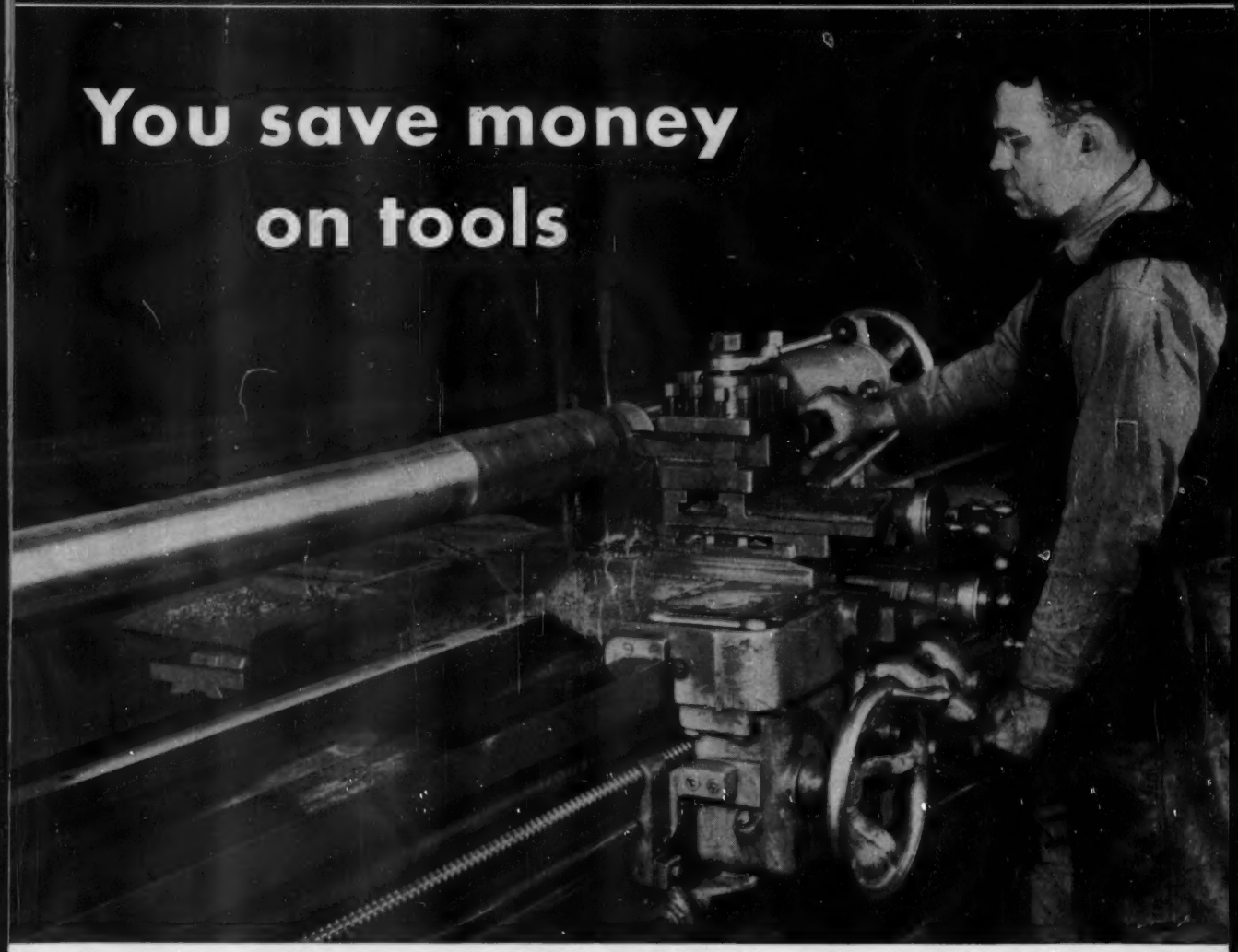
Ask for bulletin 877 on complete line of Colonial broaching machines



Unified Broaching

COLONIAL

WHY IT PAYS TO BUY USS CARILLOY FC STEEL



USS Carilloy FC Steel is free cutting. It machines more easily than other steels of comparable hardness. As a result, cutting tools last longer and require less frequent grinding. Some manufacturers can actually use deeper cuts and faster speeds with FC steel, and still get longer tool life.

Carilloy FC Steel comes to you already quenched and tempered to the hardness you require, so it doesn't require heat treatment after machining. It is available in all standard bar forms and sizes . . . within the Brinell ranges of 262 to 311. Ask your U.S. Steel Supply salesman about it, or send the coupon for our descriptive folder on FC steel.

U. S. STEEL SUPPLY
DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

USS STEEL
UNITED STATES STEEL

United States Steel Supply
208 South La Salle St.,
Chicago 4, Illinois

Please send me, without obligation, a copy of your descriptive folder on pre-hardened, free-cutting USS Carilloy FC Steel.

Name .....

Firm .....

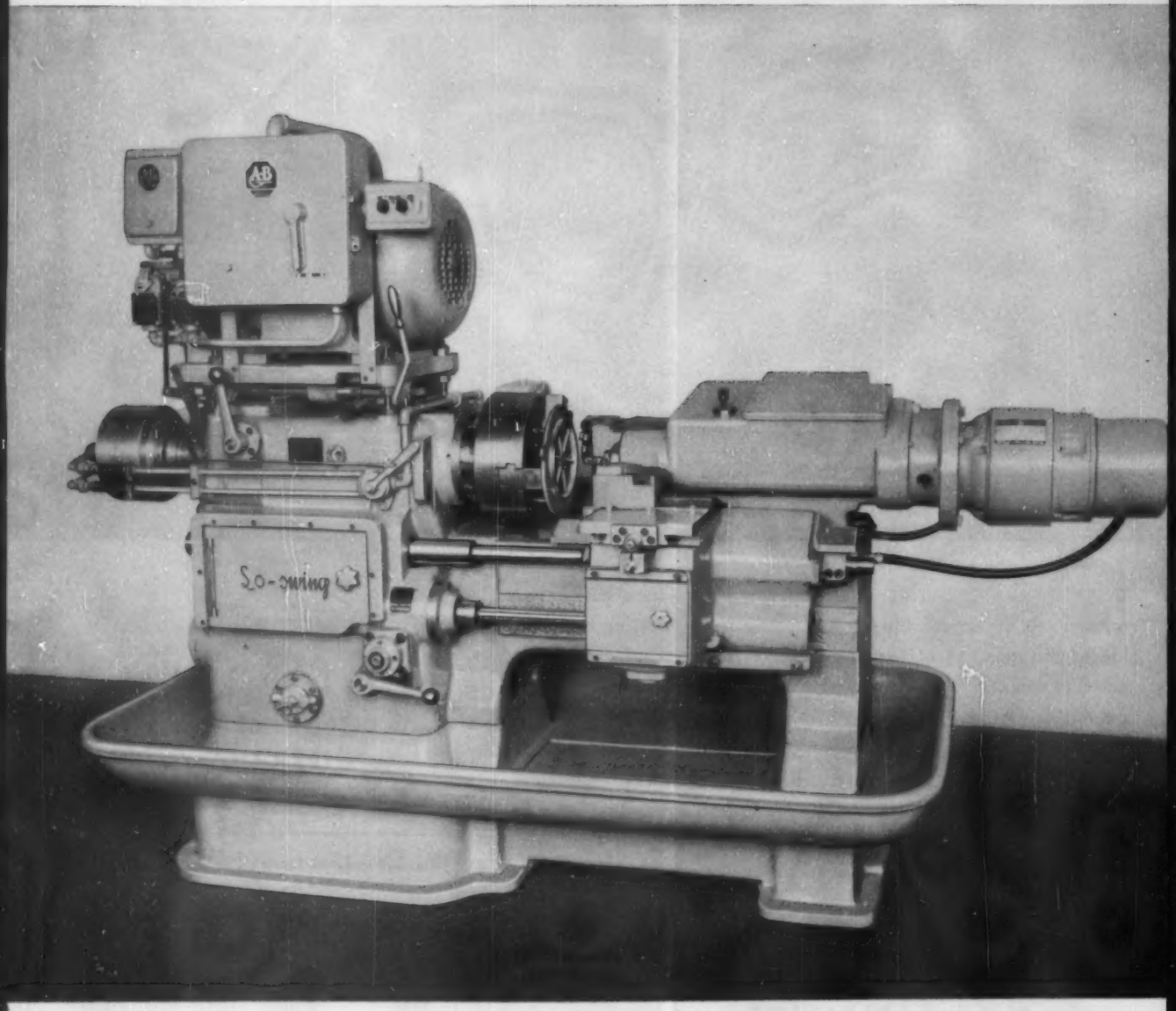
Address .....

City & State .....

UNITED STATES STEEL

MACHINE OF

MODEL "LR" So-swing DRILLS AND REAMS SIMULTANEOUSLY WITH TURNING AND FACING OPERATION



PRODUCTION COSTS

THE MONTH

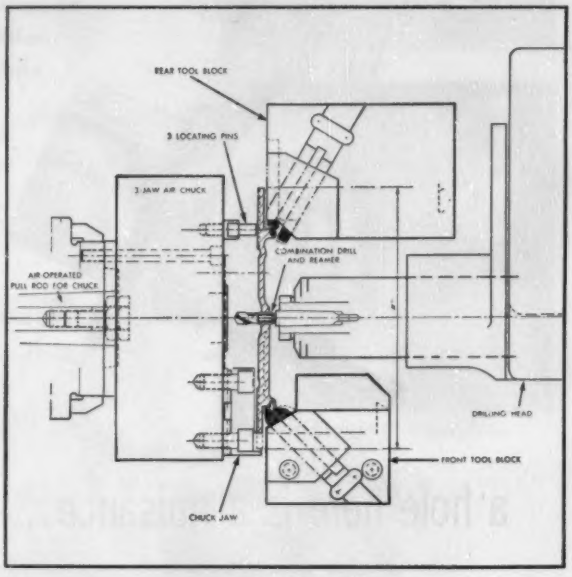
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Problem: To turn, face and groove the large diameter of a direct drive clutch, and to drill and ream center hole in a single operation.

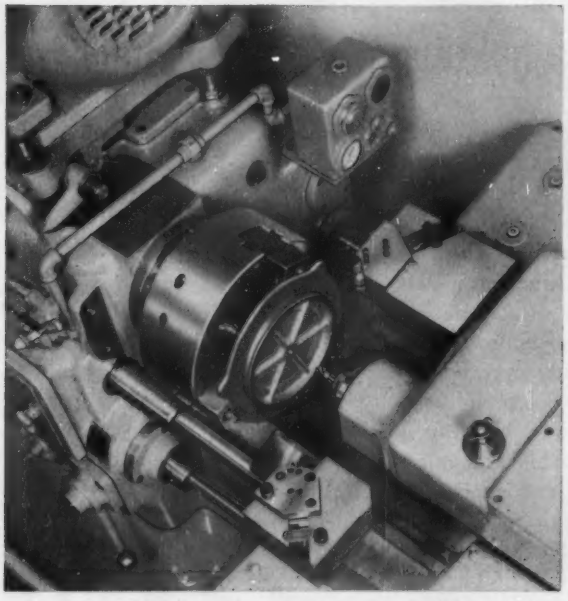
Solution: The Model "LR" *Lo-swing* Automatic Lathe selected for this job was equipped with a special Drilling and Reaming Attachment which replaced the standard tailstock. This attachment is an electrically-driven, self-contained unit with its own feed cam which permits fine feed for drilling and coarse feed for reaming. Two tools on the front carriage turn two diameters. Two facing and one grooving tool are mounted on the back attachment. While all tools, including the drill, operate simultaneously, the motorized drilling head provides the correct speed for drill and reamer, while the main headstock drive provides correct speeds for machining the large diameters.

The work, which is cast iron, is held in a 3-jaw, air-operated chuck. Machining tools are cemented carbide while the combination drill and reamer is of high-speed steel.

Seneca Falls engineers are at your disposal. Let us help solve your turning problems.



Tooling layout for machining and drilling Direct Drive Clutch.

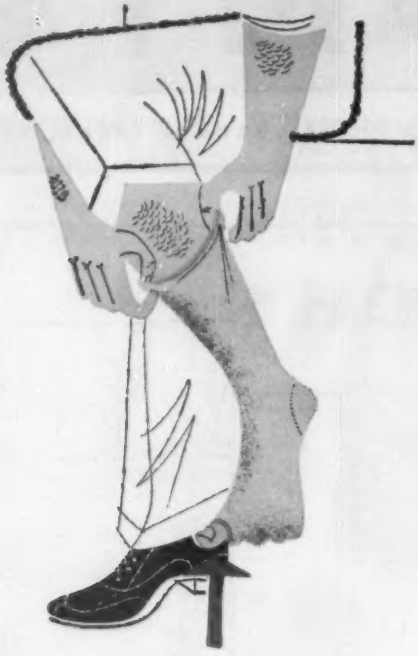


Close-up view showing tooling and work.

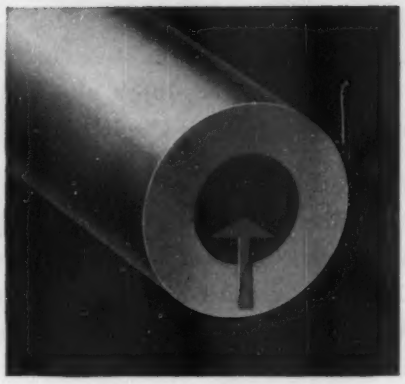
Model "LR" Lo-swing Automatic Lathe equipped with Special Motorized Drilling Head.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

ARE LOWER WITH *Lo-swing*



a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

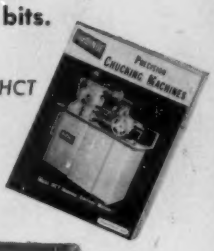
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

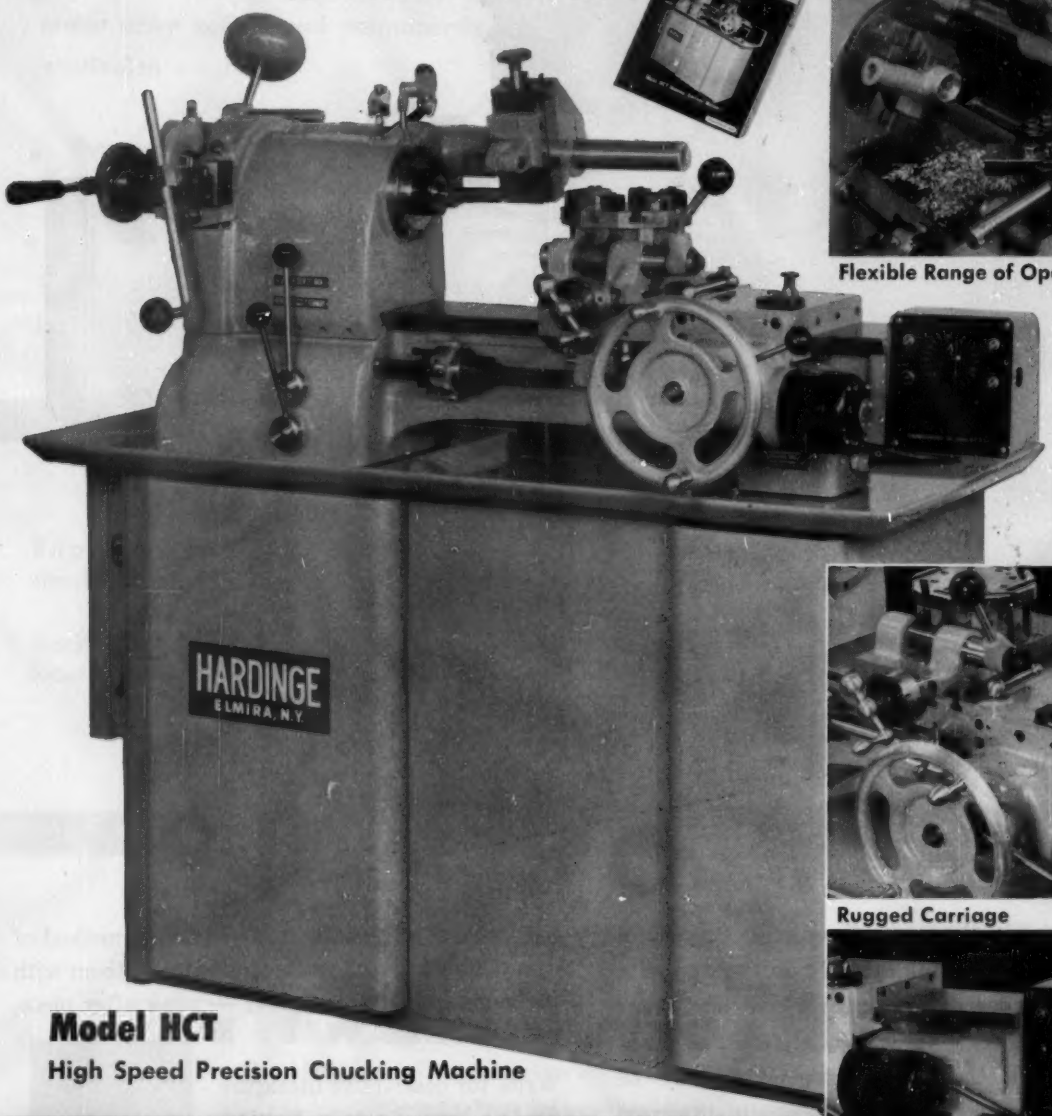
HARDINGE
ELMIRA, N.Y.

PRODUCTION
With Tool Room Accuracy

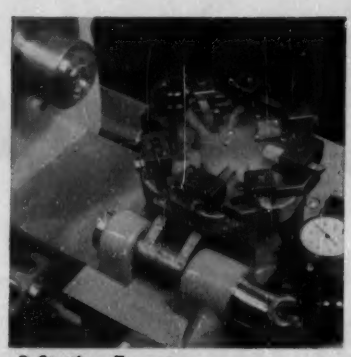
Hardinge Precision Chucking Machine HCT finish diameters, recesses, shoulders, back faces, front faces, and cuts precision threads *in one setting — all concentric* with each other. Tooled inexpensively with standard tool bits.

For complete information write for Bulletin HCT



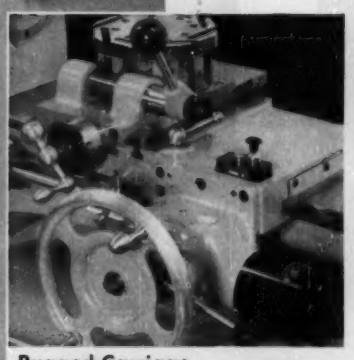


Model HCT
High Speed Precision Chucking Machine

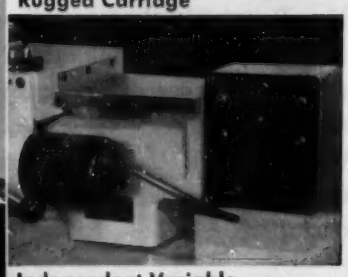


8-Station Turret

Flexible Range of Operation



Rugged Carriage

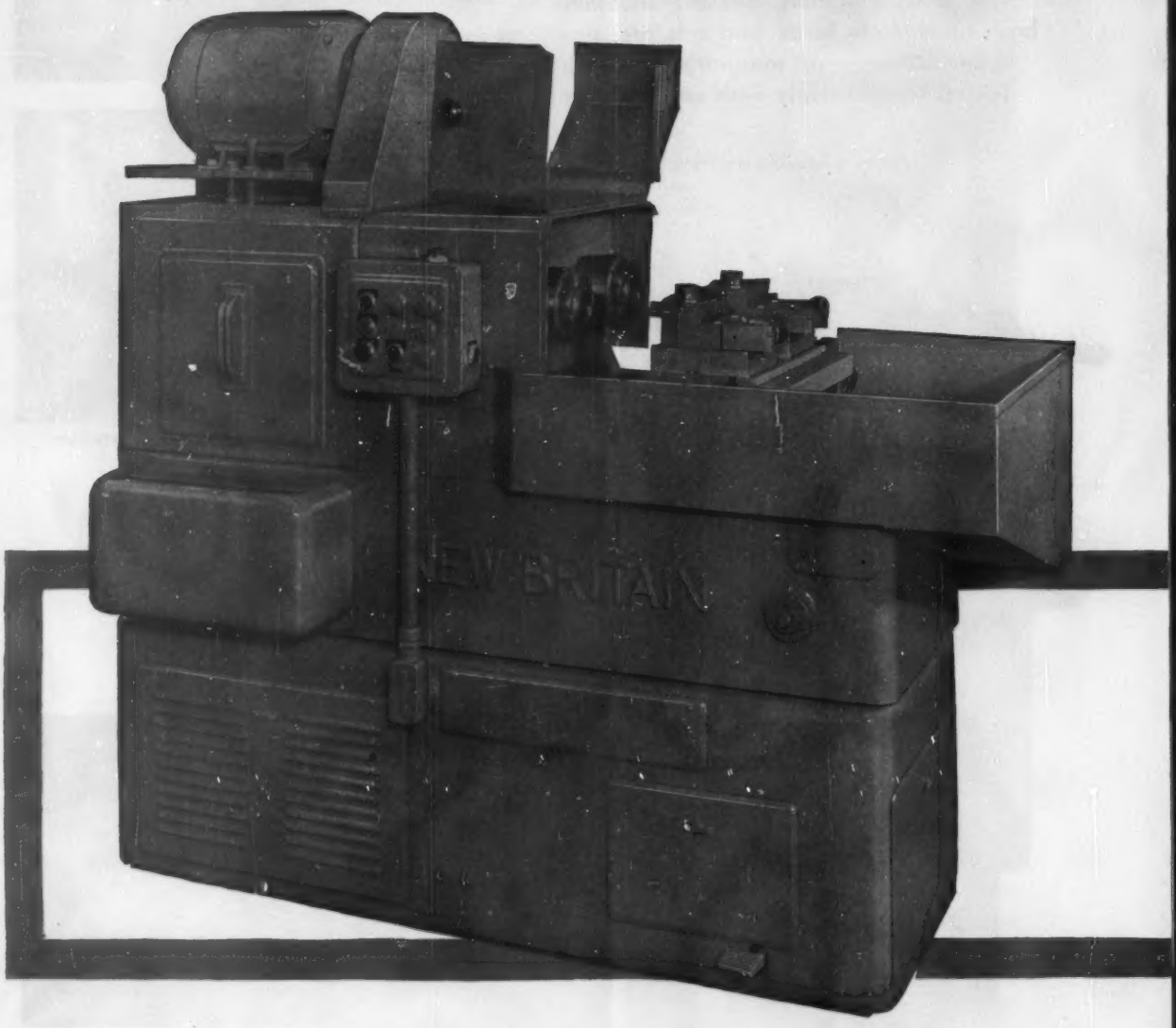


Independent Variable Carriage Feed

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

The Advantages of PERMANENTLY



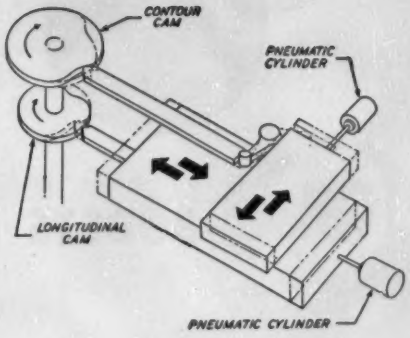
New Britain's exclusive application of cam control (illustrated diagrammatically on the opposite page) gives your tool engineer a completely new approach to tooling for complex pieces. Methods impossible on other types of machines can be employed to speed production and eliminate second operations.

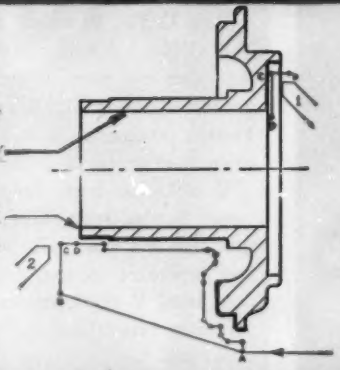
A New Britain precision boring machine will not only turn out a wide variety of work at high speeds, but, because of New Britain's exclusive method of cam actuation, will continue producing them with the same repetitive accuracy — piece after piece, week after week.

Write for descriptive literature on the New Britain boring machine line, including the details of a variety of specific parts turned out on New Britains.

Cam Actuation....
PRESERVED in New Britain's Precision Boring Machine

- Cam shaft, as well as super precision spindles and their motor drive solidly and permanently mounted to frame for continuing accuracy.
- Rugged precision lever transmits cam motion to cross slide.
- This exclusive method means simple permanently accurate compound slide motion for an endless variety of single point tool paths.





With conventional methods, pieces like this present a problem of costly tooling. With New Britain's new approach, tooling this piece is fast, simple and economical with a single chucking and two single point tools.

When you invest in Boring Machines PICK THE MAKE WITH THE EARNED REPUTATION.

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

Our general catalog is filed in the Sweet's Machine Tool Catalog File.

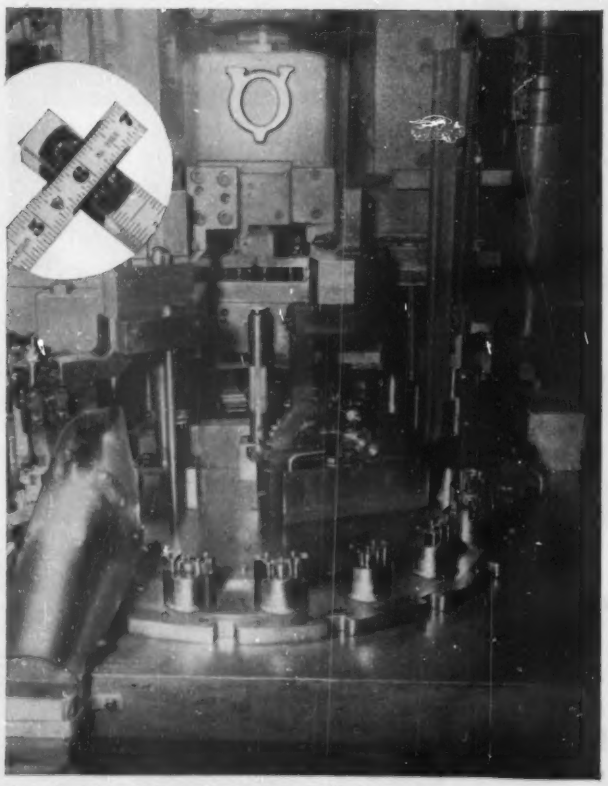
NEW BRITAIN *Automatics* NB

Machines for Making Progress

AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

In continuous cycles the V & O #50S Press with dial feed turns out 20,000 complete clamp assemblies for folding wood rules in the regular working day. From right to left—the spring is stripped from a magazine, the female and male clamp halves are formed, an eyelet inserted and expanded, and the complete assembly delivered to a hopper.

AUTOMATED V&O PRESS BOOSTS MAN-HOUR PRODUCTION 2000%



The 18 station dial feed on the V & O #50S Press at the Master Rule Mfg. Co. has supplanted 13 smaller presses and more than tripled total daily production. So accurate is the alignment of the press that the dies are removed for sharpening only after each five-millionth piece. Production per man-hour is up over 2000 per cent.

Fourteen men and fourteen machines, working an overtime schedule, previously produced 6,000 clamps for wood folding rules a day at Master Rule Mfg. Co., Middletown, N. Y. Now, one of the original presses, a V & O No. 0, makes the stainless steel springs. A V & O No. 50S with dial feed and two progressive dies has taken the place of the other thirteen machines for producing the clamp halves and completing assembly. Present production, with two machines and two operators, is in excess of 20,000 clamps for a 7½ hour day.

V & O has been designing and building precision power presses since 1889. Because they are built like precision machine tools you can safely use the clever and expensive tooling required for automation. With automated V & O presses you can depend on higher precision production and you can count on lowered unit costs.

Our representatives will be glad to show you how V & O automation can make your operations more productive and more profitable.

THE V&O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

65th Anniversary

Only the best is good enough

how the Aircraft Industry gets better threaded studs...

with NATIONAL ACME "FETTE" self-opening thread rolling heads

rolls threads

FASTER

SMOOTHER

STRONGER

CHEAPER

than any other tool

Precision is a must in the aircraft industry and the threading of studs is no exception. Here, thread specifications call for close tolerances and fine finish in materials that are tough to work with—stainless, high alloy and heat treated studs.

Rolled threads meet the requirements and National Acme "Fette" heads roll 'em at lower cost—save investment in second operation machines and often avoid rehandling because the heads can be applied to primary machining equipment.

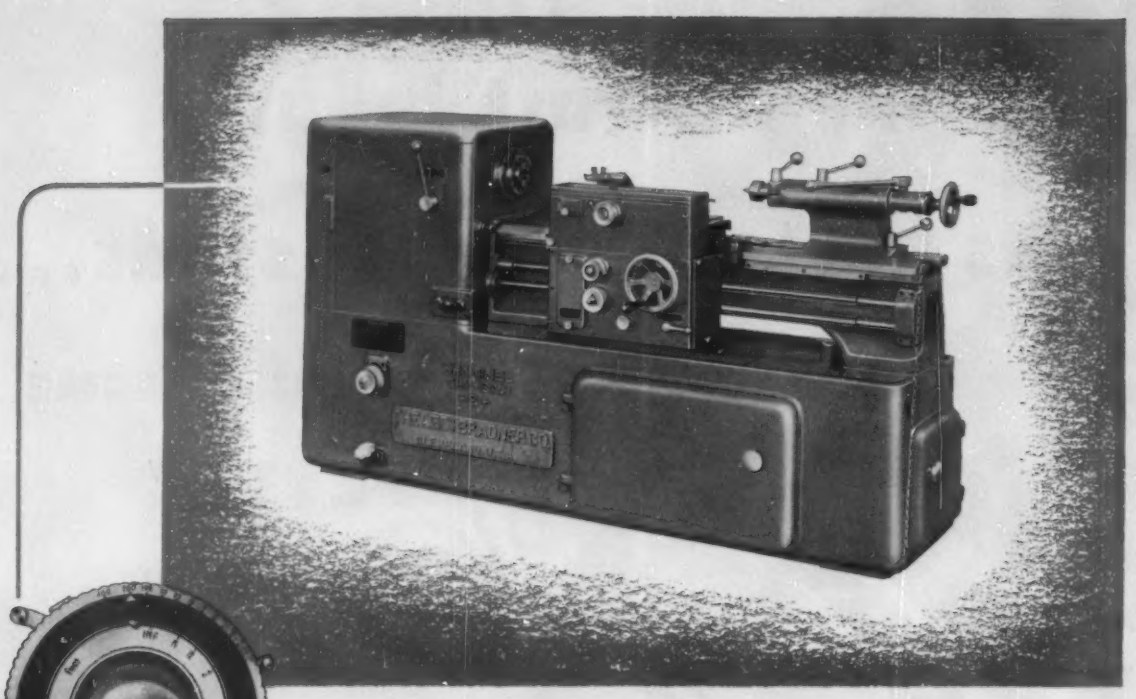
These heads generate the thread ahead of the rolls insuring a flow of metal to full thread form without cratering at the crest—smoother, stronger threads with a burnished surface. And rolling speeds are the same as turning speeds with high speed tools.

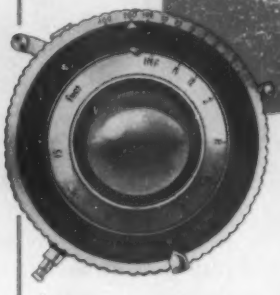
Bulletin FRH-53 shows specifications of the six head sizes —1/16 to 3/4" in non-revolving type head, 7/16 to 1" revolving type—or, ask your engineers to talk with ours.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids





CRI-DAN BRIGHTENS THE PRODUCTION PICTURE AT Eastman Kodak

Over a half-million lens mounts for Kodak cameras have been threaded on the Cri-Dan "B" during the past year. This fact, coupled with the extreme precision demanded in camera manufacture, dramatically proves that CRI-DAN Threading Machines combine accuracy and speed to an extent heretofore unknown.

Key to CRI-DAN's efficiency is the single carbide point tool which threads with unusual speed and accuracy. Changeover is fast and tool cost low.

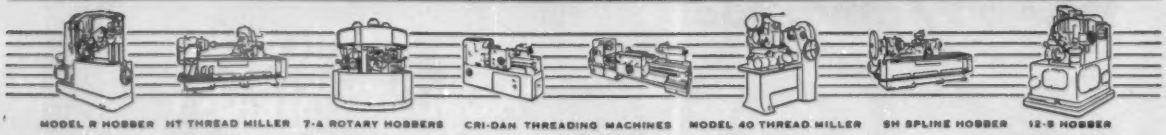
Take steps now to brighten your production picture. Get all the facts on CRI-DAN Threading Machines from your Lees-Bradner representative, or write direct.

CAPACITIES

Spindle Speed (In 24 Steps)	145 - 2800 RPM
Swing Over Saddle	4"
Swing Over Bed	13"
Capacity Between Centers	36"
Max. Thread Length	2½"
Max. Diameter Thread	4"
Rated Max. Capacity	10 TPI
Max. No. of Thread Starts	12
Max. Taper Thread	25° Incl.
Max. No. Passes Per Thread	32

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

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Welding Department
P. O. Box 868, Pittsburgh 30, Pa.

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- ☐ Cast-Iron Electrodes (B-6076)
- ☐ Stainless Steel Electrodes (B-6077)
- ☐ Mild Steel Electrodes (B-6078)
- ☐ New RA Welder (B-6129)
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- ☐ Free Electrode Samples for (type of job)_____

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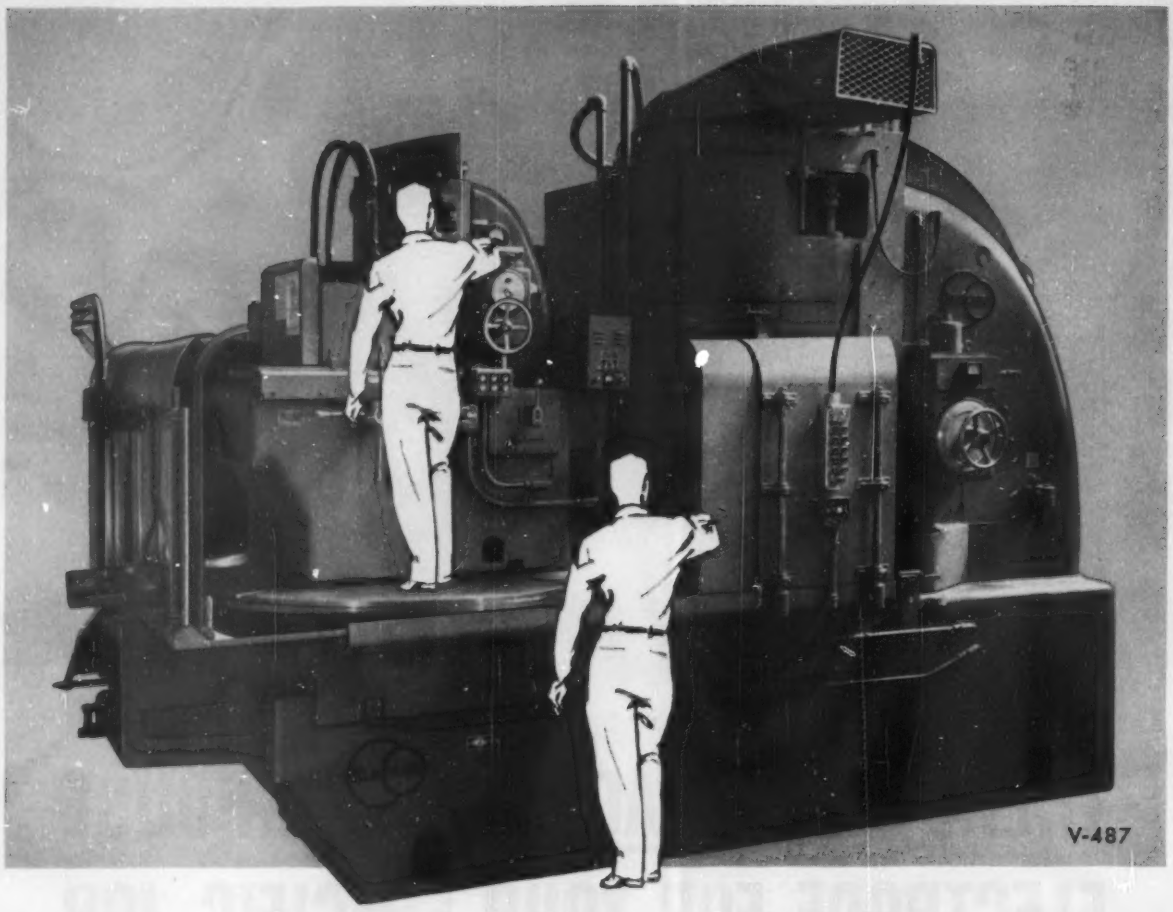

WE PUT ONE BLANCHARD ON ANOTHER

. . . to show you the wide range of sizes!

It's true! There's no "trick" photography involved. Our 5,400-lb. No. 11 Blanchard Surface Grinder fits snugly on the 84" chuck of our giant 61,000-lb. No. 42-84. And, like all Blanchards, both have chucks flat within .0002"—guaranteed!

Do every surface grinding job in your shop *perfectly* . . . whether you grind tiny watch parts—steel plates 7 feet across corners—or anything in between . . . *put it on a Blanchard.*

Whatever your requirements for stock removal, tolerances or surface finish, ask for details on the 15 standard Blanchard models today. One of them will fill your needs perfectly and will do your work with speed and precision—at costs which help you set competitive prices.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

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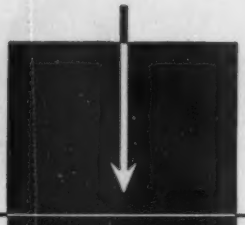
NUMBER ONE IN A SERIES

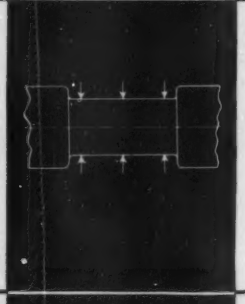
What's The Best Way To Gage These Parts?

Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage



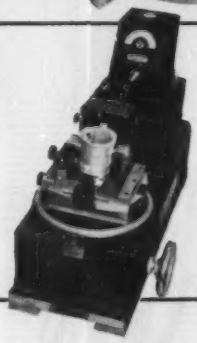
Three OD's
Tolerance: .0009″

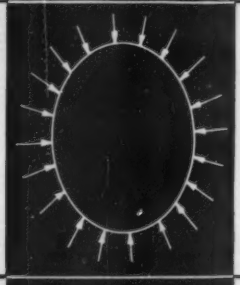
One three dial T-P CompAIRator and Air Snap Gage checks three points simultaneously on the journals of an automotive crankshaft: Functions of the diameter (taper, barrel shape, etc.) may be seen at a glance. Simple, accurate, fast — savings in inspection time alone paid for this unit in short order.



Ovality
Tolerance: .007″ on radius

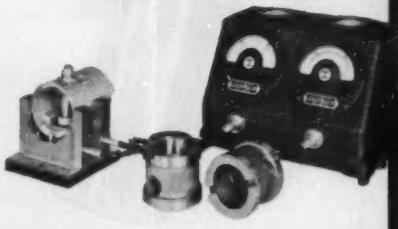
One single dial CompAIRator Air Gage checks the contour of the skirt section on this piston. Indexing table is graduated in 5° increments, permits checking entire contour at one setup. Extremely sensitive yet sturdy, vibration, jarring, tilting won't disturb the accuracy of a T-P CompAIRator.

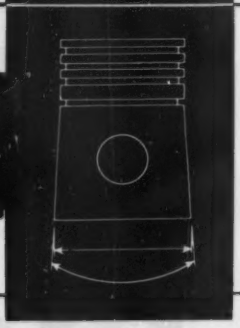




Taper and Diameter
Tolerance: .002″

A two dial T-P CompAIRator slashes former inspection costs. One indicator checks diameter. The other, a new T-P Computing CompAIRator, measures and *figures* the taper. Indicates it directly on the dial face. Eliminates usual 2 measurements and a computation. Computing CompAIRators may also be used to check center distance, concentricity of diameters, and squareness of bore to face.





For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.

STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

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OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼ to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" —also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 11/2" wide x 13/4" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

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OLIVER INSTRUMENT CO.

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EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Old Issues

Sometimes I need information that is not in the American Machinist. At this time I have on hand *AM* for the years 1952, 1953, and part of 1954, but they take up space and I would like to dispose of them.

Thus far, I have found no one interested in taking them. Please suggest two or three ways in which I could get rid of them. I buy *AM* for good reading and to keep up to date on anything new in the field.

O R Klepper
Hollywood, Fla

Here are three companies which deal in back issues of industrial publications and might be interested in purchasing your copies:
H W Wilson Co, 950 University Ave, Bronx 52, NY; J S Conner, 909 Boylston St, Boston 5, Mass; Rockingham Co, Newmarket, NH.—Ed.

Inflation

You published a very interesting article (*AM*—Nov 8 '54, p178) on the Olin Mathieson method of making intricate tubing layouts by welding and inflating sheet metal. It is all quite clear, except for one thing. You say that the rolled and welded sheet is pressed between metal platens and the channels inflated. How can the channels inflate if pressed between platens? Or are the platens really dies with the required pattern cut into their surfaces?

W J Kenworthy
Chicago

No, the platens are not dies, just flat plates. The inflating pressure is high enough to force them apart sufficiently to create a controlled diameter of the tubular sections and prevent any part from blowing up excessively.—Ed.

Goggles For All

As a man who thought "it can't happen to me," let me offer congratulations to Gisholt on setting up a compulsory goggle-wearing program (*AM*—Oct. 25 '54, p123). Of course, they are not the first by any means, but they seem to have gone about it in a very sensible way. Now, all

GRINETICS

By D G SMITH

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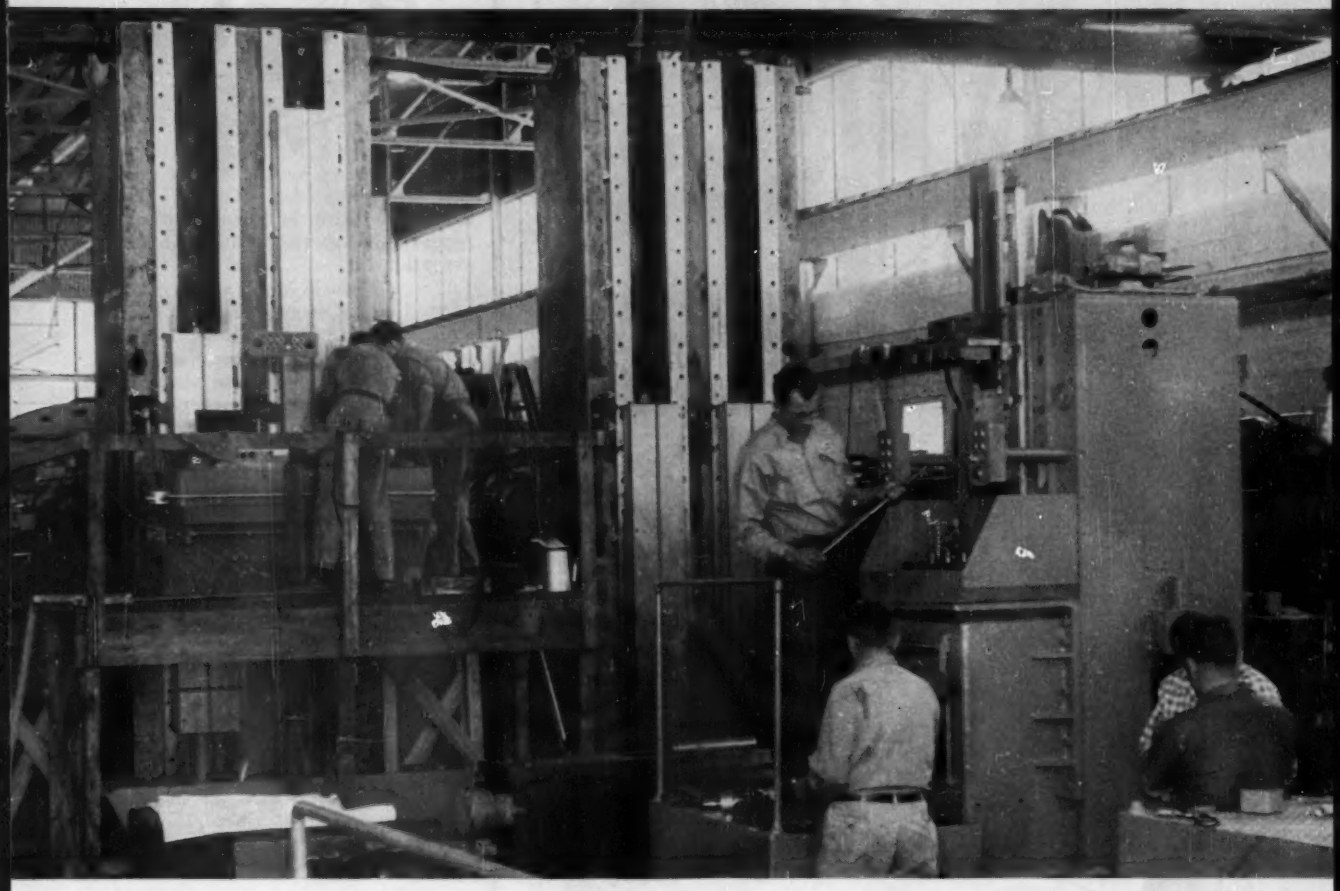
Years of Broaching Experience



Now Applied to Building
THE FINEST IN BROACHING MACHINES

Detroit Broach is in the machine tool business!

It was a logical step for Detroit Broach to move into this activity. Here is a company that is known throughout the world as a pioneer and leader in the design and manufacture of broach tooling. The engineering abilities that have built this reputation, and the knowledge gained through the application of the tooling to machines of every make and model, are reflected in these new machines which are already demonstrating exceptional production efficiency in broaching. Incorporating proven features—such as Oilgear hydraulic equipment—with many advanced design ideas, they are establishing new standards in the broaching machine field.

Today, Detroit Broach offers you the "complete package" in broaching . . . from a single broach to a completely tooled machine . . . produced to meet *exactly* every requirement for accurate, trouble-free performance.

4081

WHATEVER YOU
NEED IN BROACHING
DETROIT BROACH
CAN SUPPLY IT

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

for a fabulous finish...

Jewel Brand
ABRASIVE BELTS

in all grits and widths for grinding, sanding, polishing metal, wood, leather, plastics, rubber.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
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Massachusetts

they have to do is to see that the program is carried out—with no exceptions!

Where I work, even visitors are handed a pair of goggles when they walk in the front door, and if they take them off or push them up, we don't hesitate to tell them about it. One day the plant manager came through the shop in a rush without his glasses. One of the men on a machine saw him and spoke to him. He apologized and went back and got them in spite of his hurry.

I take a sort of second-hand pride in this because it was on account of my accident that the program was started. We had a rule about not grinding without goggles. Who hasn't? But nobody bothered to enforce it. I only wanted to just touch up the edge of a tool, but my fingers were oily and the tool slipped and hit me square in the eye. Next week, the "everybody wear 'em" program was put in force and we haven't had an eye accident since. But I'm still. . . .

One-eye Louie
Chicago

More About Horses

Why pick on Chrysler, Mr Landauer? I admit that the argument you quote (*AM*—Nov 8 '54, p94) is pretty silly, but I suppose that somebody in the sales dep't was given the job of trying to find some alibi to be foisted onto the public, and this was the best he could come up with at the time. It would have been much simpler if they had just said, "We didn't start this stupid race, but peo-

ple have been 'sold' on the idea of tremendous horsepower and we have to go along with it if we want to hold our place in a highly competitive market."

I agree with you 100% in your gripe against this silly power race, and I'll add one of my own. They are now making a big fuss about getting from a standstill to 60 mph in 10 sec—or something equally silly. Can anyone tell me what earthly use this is? Why should anyone want to get to 60 mph in 10 sec? Of course, there may be silly kids who think they are being clever by getting away from stoplights in an all-fired rush, only to get caught by the red light at the next intersection, but no adult-minded person has any use for such stupidity. Still, as I said before, don't blame Chrysler. The whole bunch are equally guilty.

Thos Reinauer
Houston

Safety First

I was shocked to see your article on making sports-car tailpipes (*AM* — Oct 25 '54, p158). There's nothing wrong with the article itself, but did you not notice that there isn't a single safety precaution being taken on any of the six presses shown? The die sets are unguarded, there are no two-hand switches, the operators (women) have their hair uncovered, and some of them are wearing wrist watches. Just because there are no rotating machines doesn't mean that safety can be forgotten.

Geo R Tomkins
Detroit

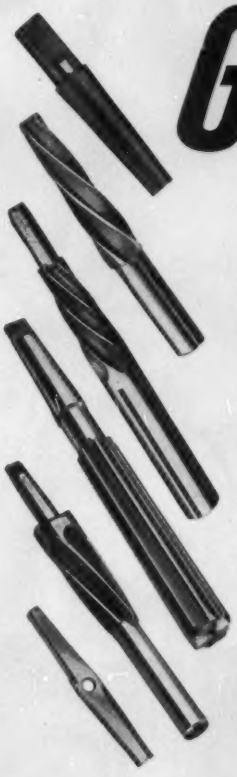
Whodunit?

Just a thought on your discussion "Slide-Rule Foremen" (*AM*—Oct 25 '54, p157). Curiosity prompts me to ask: "What horrible crime did the engineer commit to deserve the demotion in the first place?"

Eugene K Chapman, Jr
New Bedford, Mass

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

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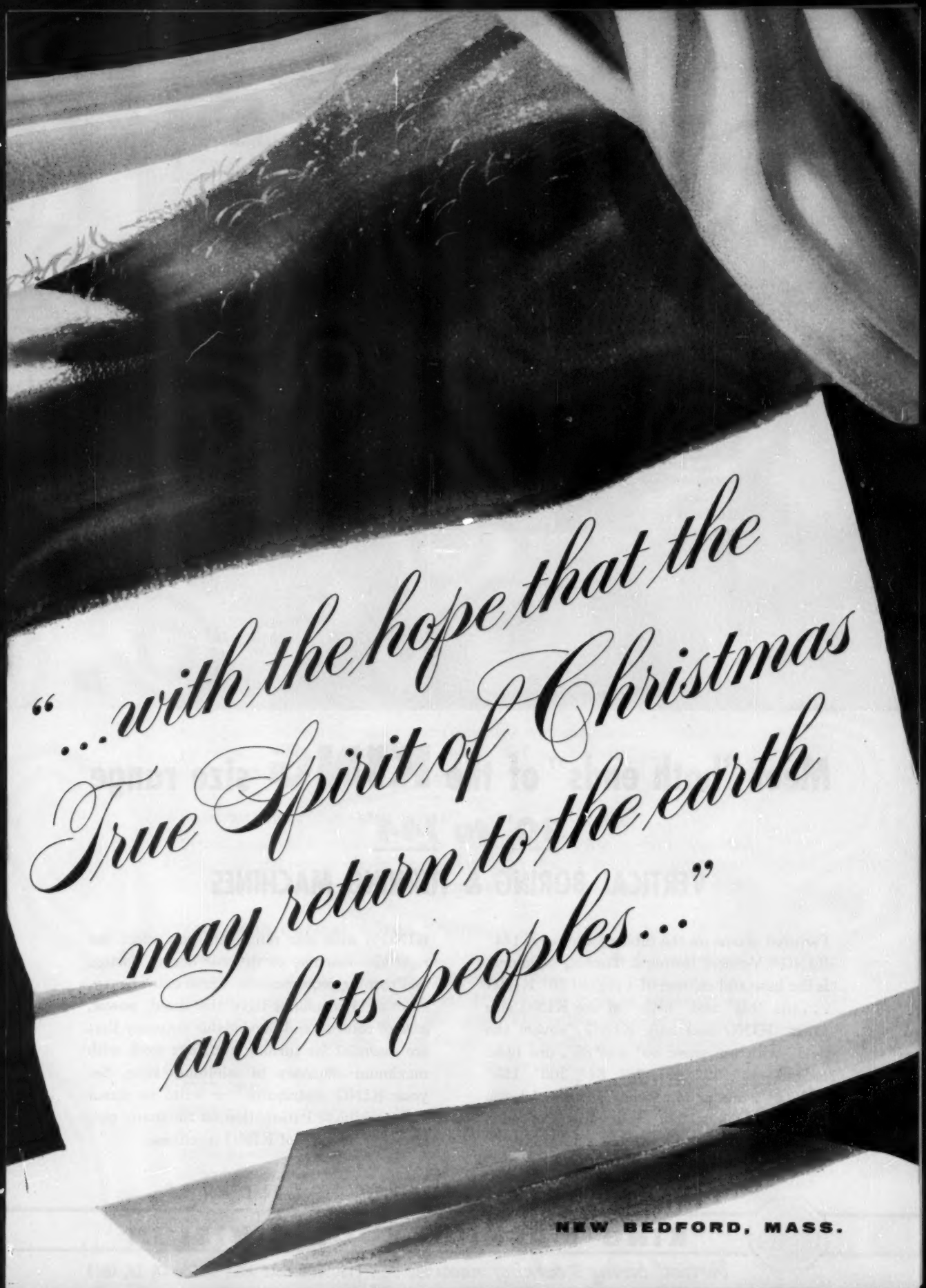
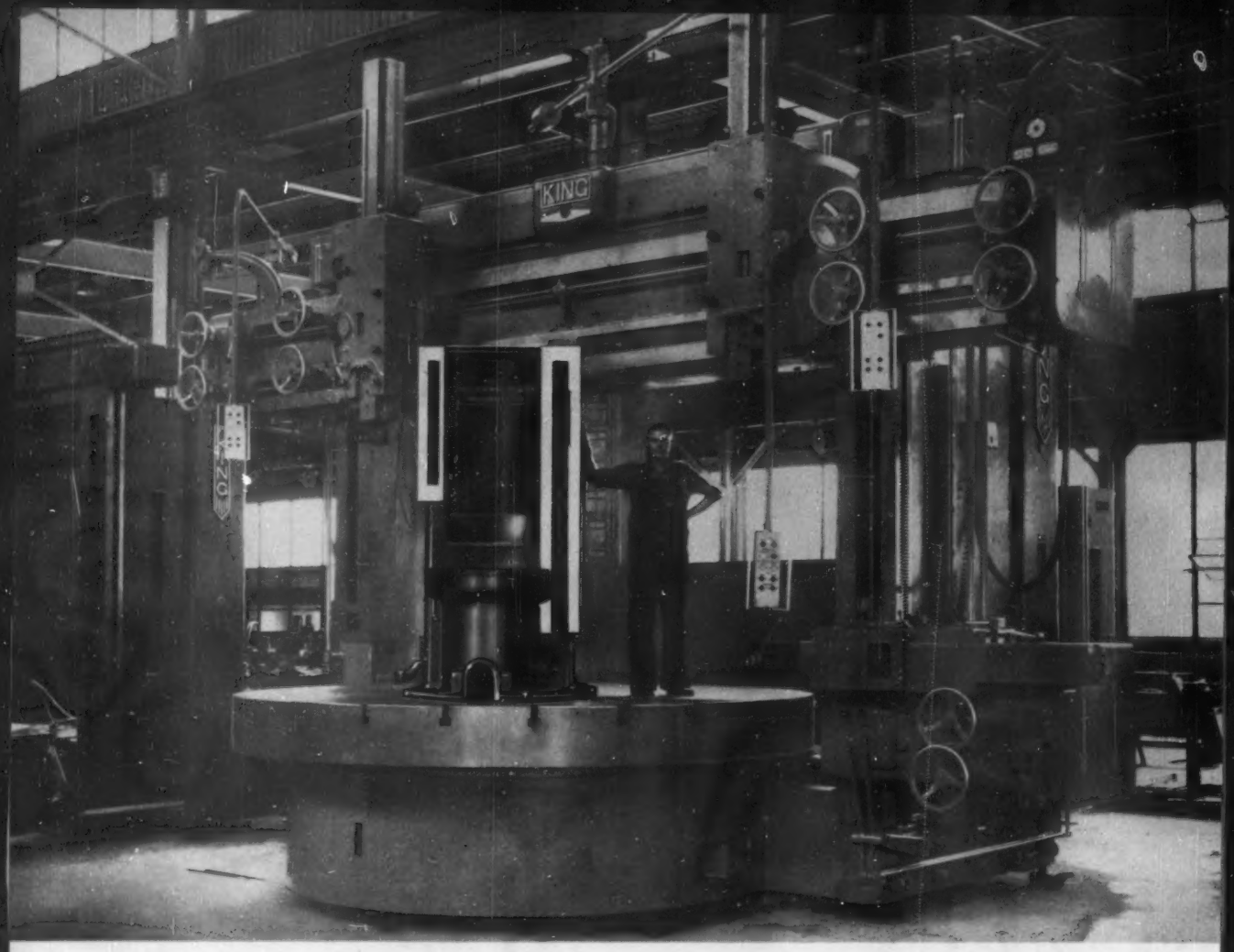
MORSE TWIST DRILL AND MACHINE COMPANY


"...with the hope that the
True Spirit of Christmas
may return to the earth
and its peoples..."
NEW BEDFORD, MASS.



Meet "both ends" of the KING size range

30" to 144"

VERTICAL BORING & TURNING MACHINES

Pictured above, on the table of a massive 144" KING® Vertical Boring & Turning Machine, is the base and column of a rugged 30" KING . . . the "big" and "little" of the KING size range. KING and *only* KING "covers the field" with ten sizes: 30" and 36", one head on rail—42", 52", 62", 72", 84", 100", 120" and 144", one or two heads on rail. All size KINGS are available in a variety of head combinations, with or without side head.

KING'S wide size range lets you select the *right* size machine to fit *your* boring, facing, and turning requirements. These extra-heavy, extra-rigid machines have the speed, power, ease of control, and dependable accuracy that are essential for turning out your work with maximum efficiency in minimum time. See your KING distributor—or write us direct—for complete information on the many outstanding features of KING machines.

AMERICAN STEEL FOUNDRIES

KING MACHINE TOOL DIVISION

Vertical boring & turning machines . . . 1150 TENNESSEE AVE., CINCINNATI 29, OHIO

Spot News of Metalworking...

• US INDUSTRIAL AID FOR FREE ASIA ...

A 10-year Aid-to-Free-Asia program is in the works — and it will mean more business for US capital goods producers. The program, which may run as high as $1 billion a year, will concentrate on new industrial plants to raise Free Asia's long-term living standards, rather than on consumer goods aid.

• CATALYTIC DISTILLATION OF TITANIUM ...

Pure titanium metal is being produced at Britain's Fulmer Research Institute by catalytic distillation, similar to the laboratory process for obtaining pure aluminum. So far it's not known whether titanium can be produced commercially by this method cheaper than by magnesium reduction or electrolytic methods.

• DOUGLAS WAGE BOOST ...

Douglas Aircraft's El Segundo, Calif, Division (25,000 workers) has settled with IAM Lodge 720 for an average increase of 6¢ an hour (or 3% across the board) and will pay all life, surgical and hospitalization insurance (formerly shared by company and employees). Union says this equals 3¢ an hour more.

• VOLKSWAGEN OUTPUT ...

Spectacular increases in output of Germany's Volkswagen automobiles have caused such unfavorable publicity abroad that the company will no longer publish monthly production figures — only total annual output figures.

• "AUTOMATION" — TABOO WORD? ...

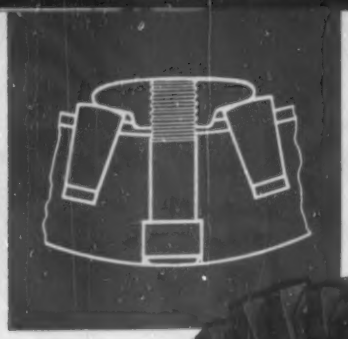
Detroit automakers are shying away from their once-favorite word "automation" like the plague — ever since UAW-CIO's Walter Reuther latched onto it as a crutch to gain a general wage upgrading for workers in automated plants.

• PENTAGON CAPITAL GOODS SPENDING ...

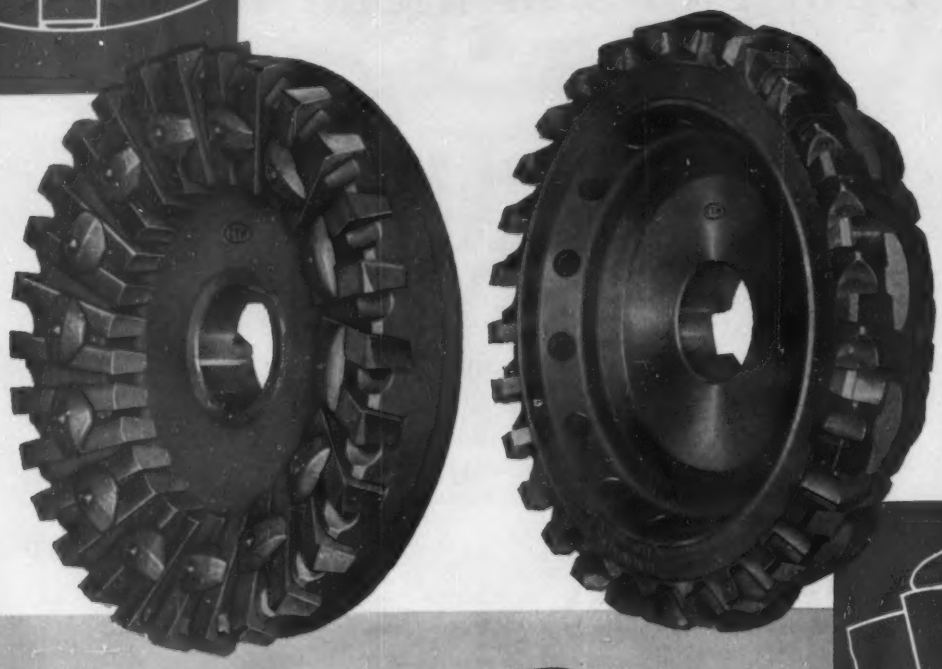
Pentagon's new spending policy on defense plant and equipment encourages use of private capital. Now, Defense Secretary Wilson must approve any contract that requires the services to buy $1 million or more in equipment for use by a contractor. Pentagon is slated to buy $400 million worth of production equipment in '55 (excluding Vance Plan) — effect on this is not yet known.

• STEP DRILL ...

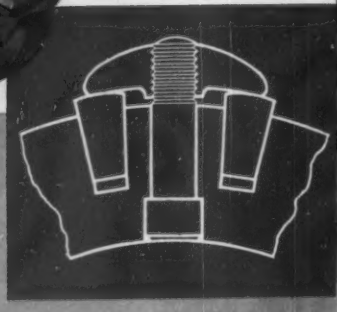
A West Coast airframe maker is reported to be saving $14,000 a year by using a "step" drill that performs boring and reaming in a single operation. The drill's diameter changes halfway through its length — the pilot portion cutting an undersized hole, and the final portion enlarging it to the desired diameter. The new drill saves 8000 drilling operations on a single bomber wing.



Continental Inside Cone Face Mill with illustration showing how blades are locked in the rugged body.



Continental Outside Cone Face Mill with illustration showing how blades are locked.



Production Proved

...AND REALLY RUGGED

Continental Inserted Blade Face Mills offer the assurance that they're "just right" for your job. They've been proved in production in Ex-Cell-O's own plants and in hundreds of plants like yours.

Whether the job calls for inside or outside blades, you'll find that eight advantages of Continental Face Mills will bring lower tool costs on tough jobs:

1. *accurately machined* tapered blade slots.
2. *hardened bodies* to prevent slot mutilation.
3. *close blade spacing,* heavy sections between blades.
4. *positive-lock* blades.
5. *simplicity:* no screw threads in body; no loose wedges or pins.
6. *easy adjustment:* no special tools needed.
7. *longer blades* give more pieces and more grinds per blade.
8. *practically-indestructible* bodies.

Blades can be furnished in any material specified and cutters can be furnished with any specified drive or with combination drives for American Standard and Ingersoll machines.

Order through your Ex-Cell-O representative or from catalog. Write on your letterhead for Catalog 60681 if you don't have one.

Continental TOOL WORKS

CTW

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

53-30

Washington . . .

Procurement officials of the military are being given far more latitude in awarding contracts for all goods they buy. This is a new turnaround in policy ordered by Defense Secretary Wilson; Army, Navy, and Air Force officials have been given 30 days to bring their regulations into line.

In effect, the new rule permits contracts to be awarded to those who aren't low bidders if officials find this necessary to maintain the mobilization base. While this has been true for many items — and thus represents no change for them — still the general rule laid down by the new team at the Pentagon was to give the contract to the low bidder even if this meant narrowing the mobilization base. "Broaden the base" was the policy laid down by General Marshall and the Democrats when the Korean war boosted our whole defense program, including industrial production of weapons.

• • •

Wilson's new order, out December 7, in effect says that the Republican narrow-the-base policy has gone as far as it can go. From here on, the policy is to keep as many contractors in war production as possible, even though this means awarding contracts to higher-cost plants.

You'll have to keep close touch with your own procurement officials to find out just how much this means to particular end-times you may be making for the military. But you can be sure of this: multiple sources of supply are now to be insisted on, and geographical dispersal of producers is to be the criteria for awarding contracts to those who can't be low bidders. This should mean greater dispersal of orders for subcontractors who make components.

• • •

To cut yourself in on military orders under the new policy, you will want to check on two lists — and they are the key to whether your plant is eligible for a contract at a price higher than the low bidder.

Pentagon has a list of about 2,000 end-items — the high priority, critical products it has to have to wage a war. This is the "Preferential Planning List."

Second list is the "Register of Planned Wartime Materiel Suppliers" — which includes all plants that either are producing end-items or components now, or are qualified to produce an end-item or component if and when their output is needed. You may be one of the 40,000 plants already on the list.

To be eligible for a negotiated contract under the new Wilson policy of broaden-the-base, you will have to be listed on this "Register." And to be eligible for this list, you will have to be qualified to produce either an end-item or component for an end-item on the "Preferential Planning List."

• • •

Most significant point in the production allocation program is that probably only 25% of any critical item may be produced in a potential target area. For example, if a guided-missile manufacturer has been producing the missile entirely in Philadelphia, under terms of the newly revised program, 75% of that missile production must be dispersed to other manufacturers away from a target area.

Obviously, this policy isn't a black-and-white turnaround, since many items have been negotiated on such a basis down through the years. But the big thing is that the top policy makers have now taken their stand to push things as much as possible in the new direction.

This can't happen overnight. But officials are going to require reports from procurement officials, every 60 days to learn just how the contract awards are tracking with the new directive.

You will know when the order begins to take effect, because it will mean taking business away from big low-cost producers. Nevertheless, top officials are convinced that dispersal is the key to survival in an atomic war — and that they have to begin to move in this direction.

• • •

Labor Secretary Mitchell's public condemnation of state "right to work" laws gives a boost to organized labor's fight against such provisions in effect in 17 states. These laws bar unions from making contracts that require a worker to join a union to keep his job. Taft-Hartley specifically allows outlawing of the union shop by the states, although the federal law permits the union shop. It's the only issue in which T-H can be superseded by state laws.

While Mitchell opposes the state laws, there's no certainty that the White House will back him up by proposing to delete the T-H section that permits the states to act in this area. There's plenty of opposition to Mitchell's view in administration circles, mainly from Sinclair Weeks.

• • •

In the past, NLRB has okayed AFL Machinists' moves to carve out bargaining units of machinists and tool and die makers in industrial plants. But in the latest decision, the union got turned down in trying to take over such a unit as Solar Mfg. Co, Vernon, Calif. Plant was wholly organized by AFL Electrical Workers. Later the firm added a machinists and tool and die division. AFL Machinists wanted to represent them. NLRB rejected the move on grounds that workers were normally part of the whole bargaining unit in plants similar to Solar.

How Much Automation for You?

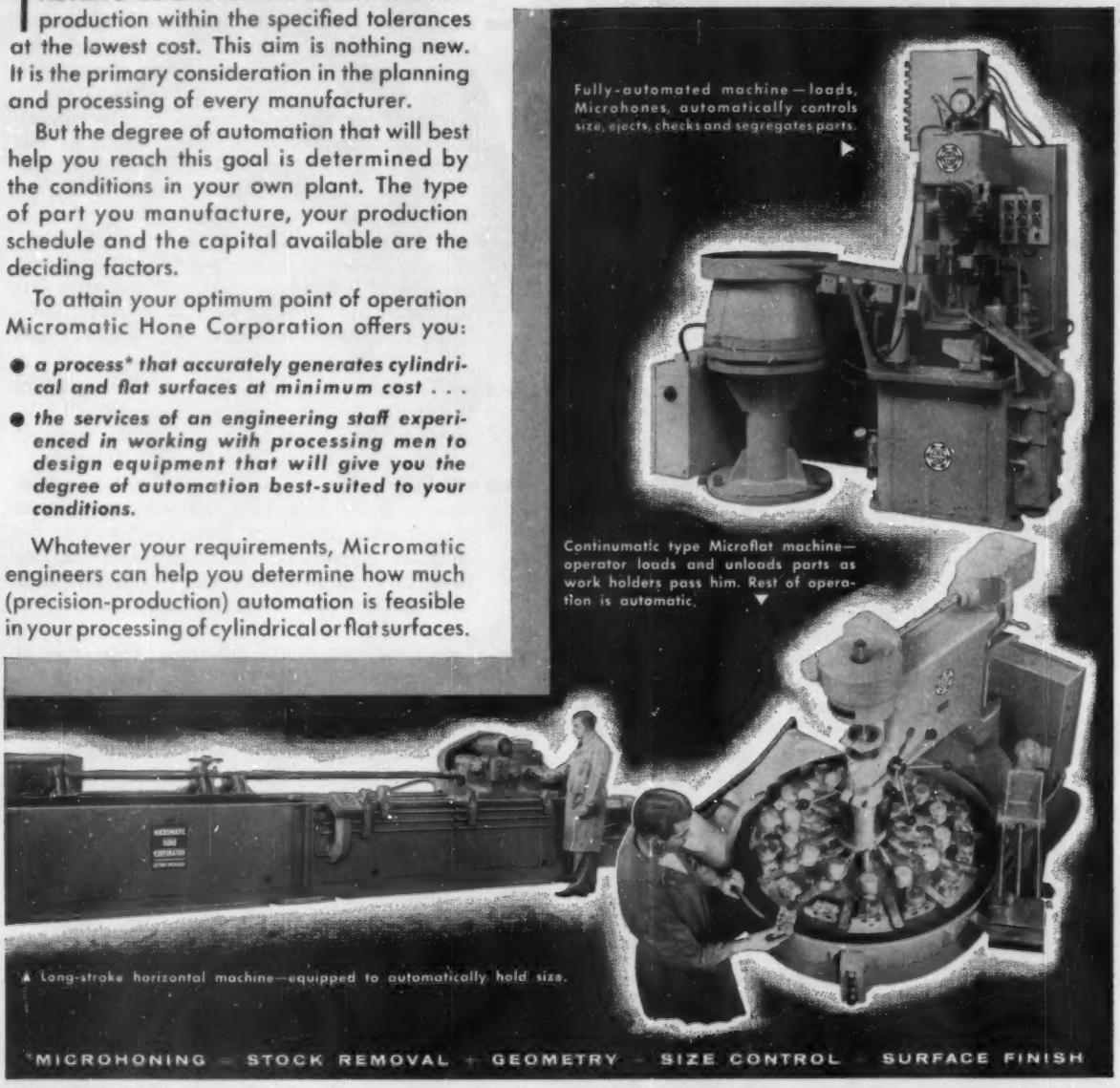
THE AIM of automation is to obtain maximum production within the specified tolerances at the lowest cost. This aim is nothing new. It is the primary consideration in the planning and processing of every manufacturer.

But the degree of automation that will best help you reach this goal is determined by the conditions in your own plant. The type of part you manufacture, your production schedule and the capital available are the deciding factors.

To attain your optimum point of operation Micromatic Hone Corporation offers you:

- ***a process* that accurately generates cylindrical and flat surfaces at minimum cost . . .***
- ***the services of an engineering staff experienced in working with processing men to design equipment that will give you the degree of automation best-suited to your conditions.***

Whatever your requirements, Micromatic engineers can help you determine how much (precision-production) automation is feasible in your processing of cylindrical or flat surfaces.



Fully-automated machine—loads, Microhones, automatically controls size, ejects, checks and segregates parts. ▶

Continumatic type Microflat machine—operator loads and unloads parts as work holders pass him. Rest of operation is automatic. ▼

▲ Long-stroke horizontal machine—equipped to automatically hold size.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

For more information write for general catalog and CROSS-HATCH Vol. 6

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Detroit . . .

A year ago, several auto men made these predictions for production and/or sale of cars in 1954:

Chrysler President L L Colbert estimated that the industry would assemble 5.5-million cars; Chevrolet General Manager W E Fish expected sales to be down about 15% from 1953 (or about 5.2 million); Joseph Bayne, Lincoln-Mercury general manager, expected "at least 5 million"; Ford Div General Sales Manager L W Smead figured 5.3 million to 5.6 million was a good bet.

A group of auto writers pooled their individual forecasts and came up with an average estimate of 5,543,000.

Colbert seems to have been closest. Production schedules for the balance of the year suggest that about 5,503,500 cars will have rolled off the lines this year.

• • •

Auto executives are charged with duties other than forecasting markets, however, even though the average wage earner is sometimes left open-mouthed when he reads of the salaries and bonuses paid to top auto men over a year's time.

"What," he's liable to inquire, "did that fellow do to rate half-a-million dollars? Nobody's worth that kind of dough."

Maybe so. But a critic can get a clearer idea of how an executive earns his pay by putting himself in the executive's position right now.

• • •

The auto man is beset by this outlook: The CIO Auto Workers' union seeks 1955 contract changes that automakers, without exception, say they cannot grant.

The union says companies are able to grant the package, and announces that it is prepared to strike any holdout.

Management is faced with the prospect that if it does not enter into a contract which guarantees wages, it will be shut down. And a strike of any duration these days could cost a company a large share of the market, a share it might not recoup for years, if ever.

What to do? For one thing, the company can try to stockpile autos. And that is precisely what appears to be developing. *Ward's Reports,* which does not deal in guesswork but only in cold arithmetic, says the industry is scheduling production of 1,928,500 cars in the first quarter of 1955. That phenomenal rate, if achieved, will break all first-quarter records.

• • •

Moreover, the second quarter traditionally sees the greatest outpouring of cars each year when no federal controls or war scares influence production. First half programming, then, will be at an annual rate approaching 8-million units.

Nowhere has there been any suggestion that the public will absorb that many cars. Highest estimate has come from H H Curtice, GM president, who sees sales of 5.8 million cars.

Purely and simply, each company wants to have heavy stocks of cars on hand, when and if a strike is called.

• • •

UAW's "management" is just as concerned about the outlook for its bargaining position, come spring. If it hits a company whose inventory will carry it for a month or so, UAW's position will be jeopardized.

To restrict production, UAW can "wildcat" a company silly for several months. But by so doing, it sets itself up for this question from auto bargainers: "Why should we recognize you? You've shut us down at every excuse. You can't control your members."

UAW would not even break stride at that, but it would be placed in an embarrassing position, public relationswise.

• • •

Out of all this could come, too, a very sorry auto showing in the second half. Assume the industry manages to stockpile for all it's worth in the first five months or so. But instead of a strike, a peaceful labor contract pattern were to be established. Great stocks of unsold autos would prohibit continued high production through the balance of the year.

• • •

Not too long ago, it was fashionable in the auto industry to talk glowingly of the wonders of automation—the high quality work it produces, savings in money and manhours, etc.

Not so since Nov 12, however, when CIO's Auto Workers disclosed its intention to seek higher wages for workers who are responsible for the operation of automated lines.

Industrial relations men shy away from reporters who bring up the subject of automation as though the reporters had suggested that communism is better than capitalism. Manufacturing men act as though they never heard of automation. Public relations men, sitting in on interviews, clutch any statement about money or manhour savings and throw it off the record.

• • •

All this, of course, in an effort to improve bargaining positions in 1955. The "speak-no-evil" attitude, however, is like trying to conceal a common thought. Nobody denies that automation is here to stay, union or no union. Moreover, UAW's research department is entirely capable of determining cost savings on many automated processes without any help from management.

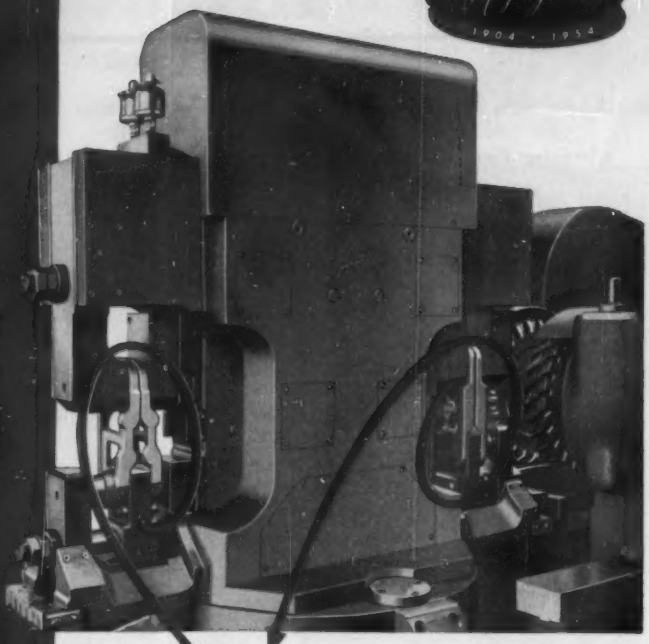
Duplex Milling

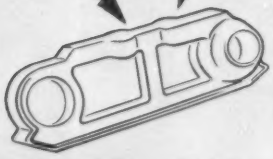
as Engineered by

MOTCH & MERRYWEATHER

may end your search

Tifty Years
1904 · 1954

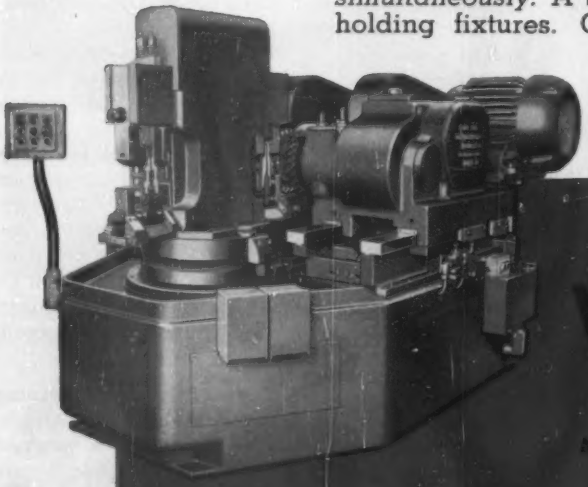




Both sides of tractor side bars are face milled. Production is 240 pieces per hour using high speed steel cutters.

PRODUCTION CAN BE RAISED 50%
by Motch & Merryweather's *Duplex Milling Method!*

• Production milling is given new meaning by Motch & Merryweather's duplex method. Two heads mill two parts *simultaneously.* A table indexing 180° has two sets of work-holding fixtures. One operator unloads and loads during *duplex milling* at the opposite fixture. Fully automatic operation sets new production limits. Consult Motch & Merryweather about your production milling.



THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

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Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

Machine Tools . . .

The $84-million machine tool buying program of the Air Force is scheduled to break very soon.

Actual purchase will be made in the usual manner through Air Force contractors. Machine tool builders will be asked to bid on the desired machines and orders will be placed shortly thereafter.

It seems unlikely that the buying period will be dragged out unnecessarily.

Ralph E Cross has been appointed as a civilian assistant to Roger Lewis, Assistant Secretary for Air, to act as generalissimo in carrying through with the program.

He will be an expediter and will have the responsibility for getting the orders placed and then filled as rapidly as possible. He will spend a good share of his time at the focal point of the program, whether it be Pentagon or Wright Field. Much of the preliminary work is being done at the latter spot.

He will wear two official hats for a while — one in his new capacity, and the other in his continuing duties as Assistant Administrator of the Business and Defense Services Administration.

The list of the types of machines to be built for the Air Force program is classified.

It is no secret, however, that the list is comprised in large part of machines that take a long time to produce, and of which there are no reserves, or only inadequate reserves, on hand.

The list reported to have been put together only recently, and not to be subject to change. Yet, in the case of one builder making a so-called critical machine not on the list, this rule did not apply. When the builder pointed out to Air Force officers the omission of his type of machine, it was added.

The $84 million constitutes the bulk of the $100 million set aside as a separate item in Pentagon's budget to be spent for reserve machines. The program puts into practical operation the Vance Plan.

• • •

Defense Dept's obligations for production equipment and facilities for use by contractors amounted to $57 billion in government fiscal years 1951 to 1955 inclusive. Some $1.1 billion of that total went for new machine tools, $1.3 billion for other new production equipment, and $300 million for rebuilding old production equipment. The remainder was for structures.

Actual spending for production equipment and facilities in those years adds up to $4.4 billion.

• • •

West German machine tool industry has done very well during 1954 — with the volume of shipments close to the 1953 figure. The number of builders still is more than 500, whereas before 1945 it was only 200. About 70% of today's companies, however, employ less than 100 men each.

Export orders have helped to keep the German industry at a high level. Around half of the production goes to foreign buyers, as against 40% prior to WWII. Relatively little of the export business comes from the United States.

Four-fifths of German machine tool exports are shipped to European customers. England and France are the top buyers — followed by Switzerland, Sweden, Norway, Denmark and Italy. German builders feel that this situation is in line with tradition, as they have historically been a main supplier to other European countries.

• • •

Virtually no West German machine tools are going to the Eastern European Bloc under Russian domination, according to reliable sources. Total shipments of the West German machine tool industry to domestic and foreign customers will amount to Deutschemark 800-900 million $184-200 million) in 1954. That compares with $1 billion in 1953.

German builders do not get any direct government subsidy or any aid in financing long-term exports. Sole export "incentive" is the fact that the federal "turn-over tax" of 4% is not collected on exports. This quasi-bonus, however, is virtually ineffective, as transportation charges and customs duties more than make up for any gain secured.

• • •

An undercurrent of uneasiness is running through the West German machine tool industry. Raw materials prices and wage rates have gone up the past two years, whereas prices are the same or lower.

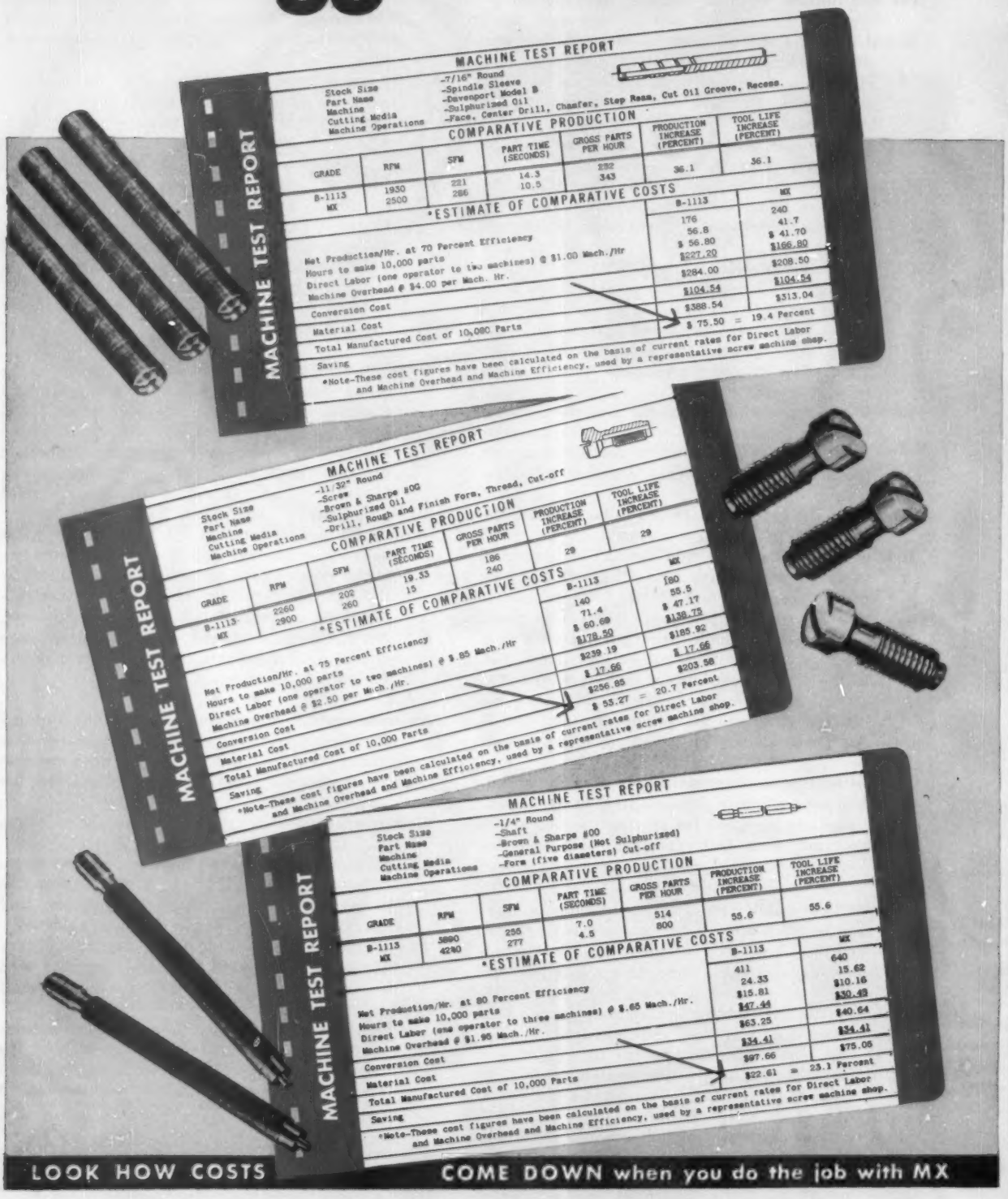
Employment remains around 60,000, the same as last year.

There is a great shortage of engineers and draftsmen. It is especially acute in the 30-40 age group as a result of the war. This is the group that usually furnishes the most productive elements.

The shortage will be aggravated by the military program, with many of the youngsters who normally enter German technical high schools going into the army.

The Germans complain that some Western nations are selling machine tools illegally behind the Iron Curtain, often via Switzerland. These complaints, however, are rarely documented or otherwise proved.

Get bigger dividends


MACHINE TEST REPORT
Stock Size -7/16" Round
Part Name -Spindle Sleeve
Machine -Davenport Model B
Cutting Media -Sulphurized Oil
Machine Operations -Face, Center Drill, Chamfer, Step Ream, Cut Oil Groove, Recess.
COMPARATIVE PRODUCTION
GRADE | RPM | SFM | PART TIME (SECONDS) | GROSS PARTS PER HOUR | PRODUCTION INCREASE (PERCENT) | TOOL LIFE INCREASE (PERCENT)
B-1113 | 1930 | 221 | 14.3 | 252 | 36.1 | 36.1
MX | 2500 | 286 | 10.5 | 343
*ESTIMATE OF COMPARATIVE COSTS
B-1113 | MX
Net Production/Hr. at 70 Percent Efficiency | 176 | 240
Hours to make 10,000 parts | 56.8 | 41.7
Direct Labor (one operator to two machines) @ $1.00 Mach./Hr | $ 56.80 | $ 41.70
Machine Overhead @ $4.00 per Mach. Hr. | $227.20 | $166.80
Conversion Cost | $284.00 | $208.50
Material Cost | $104.54 | $104.54
Total Manufactured Cost of 10,080 Parts | $388.54 | $313.04
Saving | $ 75.50 = 19.4 Percent
*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.
MACHINE TEST REPORT
Stock Size -11/32" Round
Part Name -Screw
Machine -Brown & Sharpe #00
Cutting Media -Sulphurized Oil
Machine Operations -Drill, Rough and Finish Form, Thread, Cut-off
COMPARATIVE PRODUCTION
GRADE | RPM | SFM | PART TIME (SECONDS) | GROSS PARTS PER HOUR | PRODUCTION INCREASE (PERCENT) | TOOL LIFE INCREASE (PERCENT)
B-1113 | 2260 | 202 | 19.33 | 186 | 29 | 29
MX | 2900 | 260 | 15 | 240
*ESTIMATE OF COMPARATIVE COSTS
B-1113 | MX
Net Production/Hr. at 75 Percent Efficiency | 140 | 180
Hours to make 10,000 parts | 71.4 | 55.5
Direct Labor (one operator to two machines) @ $.85 Mach./Hr | $ 60.69 | $ 47.17
Machine Overhead @ $2.50 per Mach./Hr. | $178.50 | $138.75
Conversion Cost | $239.19 | $185.92
Material Cost | $ 17.66 | $ 17.66
Total Manufactured Cost of 10,000 Parts | $256.85 | $203.58
Saving | $ 53.27 = 20.7 Percent
*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.
MACHINE TEST REPORT
Stock Size -1/4" Round
Part Name -Shaft
Machine -Brown & Sharpe #00
Cutting Media -General Purpose (Not Sulphurized)
Machine Operations -Form (five diameters) Cut-off
COMPARATIVE PRODUCTION
GRADE | RPM | SFM | PART TIME (SECONDS) | GROSS PARTS PER HOUR | PRODUCTION INCREASE (PERCENT) | TOOL LIFE INCREASE (PERCENT)
B-1113 | 3590 | 255 | 7.0 | 514 | 55.6 | 55.6
MX | 4240 | 277 | 4.5 | 800
*ESTIMATE OF COMPARATIVE COSTS
B-1113 | MX
Net Production/Hr. at 80 Percent Efficiency | 411 | 640
Hours to make 10,000 parts | 24.33 | 15.62
Direct Labor (one operator to three machines) @ $.65 Mach./Hr. | $15.81 | $10.16
Machine Overhead @ $1.95 Mach./Hr. | $47.44 | $30.48
Conversion Cost | $63.25 | $40.64
Material Cost | $34.41 | $34.41
Total Manufactured Cost of 10,000 Parts | $97.66 | $75.05
Saving | $22.61 = 23.1 Percent
*Note-These cost figures have been calculated on the basis of current rates for Direct Labor and Machine Overhead and Machine Efficiency, used by a representative screw machine shop.

LOOK HOW COSTS COME DOWN when you do the job with MX

from your screw stock

...do the job with MX

the freer-machining screw stock
available in both Bessemer and Open Hearth

USS MX FREE-MACHINING STEEL pays off in four ways—

MX lowers the cost per part by increasing the rate of production.

MX reduces down time and costly grinding by prolonging tool life.

MX often eliminates extra finishing operations by assuring better part finish.

MX helps to minimize rejection by providing closer dimensional accuracy.

These are facts proved in hundreds of shops that have used MX in more than a billion parts . . . parts of infinite variety turned out under dissimilar conditions and on screw machine equipment of many types.

USS MX Free-Machining Steel works *with* your tools—not against them. It is designed to ensure maximum cutting speeds compatible with economical tool life. As a result, production goes up and costs come down wherever fast-cutting MX is put to work.

From the many case histories we have on file, we feel that MX will cut the cost of *any* part you now machine from ordinary screw stock. You can prove this for yourself by giving MX a trial on your own machines.

And remember: Although USS MX Free-Machining Steel costs no more than ordinary screw stock, *it has been successfully machined at speeds approaching 350 SFM*—speeds far higher than the *average* speeds (under 250 SFM) used in most shops today.

So if you want lower material costs, a profitable rate of production, long tool life and good finish, your best bet is USS MX, either Bessemer or Open Hearth.

USS MX Free-Machining Steel is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

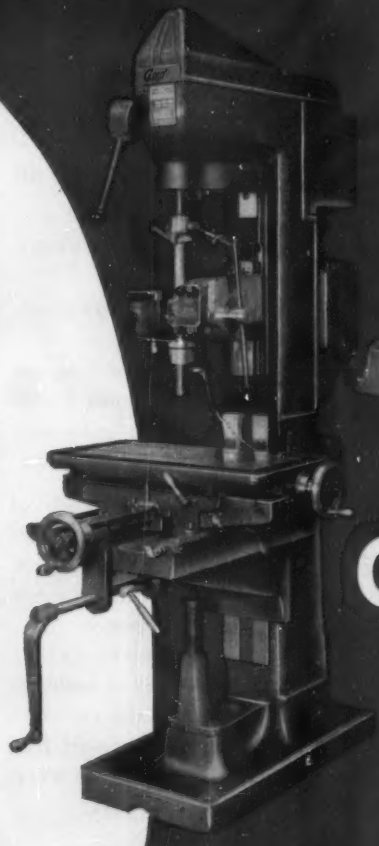
Built for ACCURACY . . . SPEED . . . and Long Lasting PERFORMANCE . . .

Avey

BMA-6

TOOL ROOM DRILLS

Built in No. 2 and No. 3 Sizes



A. LARGE TABLE MACHINE—The large heavily ribbed table, 34" x 25" plus ample chip trough, allows room for large dies or fixtures, plus additional space for tooling, etc. Each six splined precision ground spindle and drive sleeve is supported by five rows of precision ball bearings which give the precision needed. The machine has six speeds which are easily obtained through a shifter lever, positioned in front of the machine. The machine also has three speed ranges, low, medium or high which are easily changeable for future jobs requiring higher or lower speeds.

All BMA-6 Machines may be obtained in hand feed, Avey-matic automatic feed, and power feed with or without reversing motor and control for tapping.

No. 2 BMA-6 Machines may be obtained with #2 or #3 Morse Taper, optional and #3 BMA-6 Machines may be obtained with #3 or #4 Morse Taper optional.

B. ROUND TABLE TOOL ROOM MACHINE—The drilling unit is mounted on a round table, lower column, and base. The base is planed and regularly furnished with two tee slots. Above the planed base is one auxiliary bracket adjustable vertically which may position a vee center, a cup center or an additional table. Beneath the spindle is positioned the regular round table, which is 18" in diameter and contains tee slots and coolant trough. This table may be tilted either way up to 90° or can be moved to the side or rear of the machine to allow work to be done on the lower table or planed base.

C. COMPOUND TABLE MACHINE—This machine is ideal for tool rooms and die shops and may be used for layout purposes which greatly assists jig bore work. The compound table is rigidly supported by a ball bearing mounted elevating screw and has vertical adjustment on the dovetail of the lower column. The working surface of the table is 25" x 12" plus ample chip and coolant trough. In and out travel of the table is 5" either way and cross travel is 7½" either way. Both tables are moved by Alloy Steel lead screws with automatic wear take up on screws.

Both tables are scaled in ½" with dial reading on lead screws graduated to read .001. (one turn equals .250). Both tables have felt wipers on ways and table surface is regularly furnished with two longitudinal tee slots.

Consult the yellow pages of your phone book under Machine Tools—for our nearest representative or write direct to our factory.

Avey

THE AVEY DRILLING MACHINE CO. Cincinnati 1, Ohio

Gaging Metalworking . . .

PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '54(*)	OCT '54(p)	SEPT '54(r)	OCT '53
Total Index	**150**	**148**	**148**	**165**
Machinery	124	125	125	141
Electrical Machinery	195	190	190	194
Autos	86	78	78	122
Other Transportation	295	310	310	298
Other Metalworking	123	124	124	136

(*) Estimated (p) preliminary (r) revised

Metalworking production has stayed pretty much the same through most of the fourth quarter and will wind up the year close to September production levels.

That's the general picture. But when you take a closer look, the situation is extremely spotty — with some industries going great guns, others reporting so-so business, and others pretty unhappy about conditions.

• • •

A lot of stampers are in the latter category. They expected a heavy influx of Detroit orders now that the new models are out, but it seems auto orders are flowing like glue.

Several stamping firms report automotive backlogs at around 20 weeks. This is at least six weeks under normal for this time of year.

True, there's lot of shopping around, but it's mostly in the form of more-or-less casual inquiries, and more than one stamper suspects the slowness in orders is caused by an increase in auto industry in-plant stamping.

While stampers admit orders are moving better than they have since first quarter 1954, they are nowhere near fourth quarter '53 volume yet.

Consequently, the stamping people are tempering their early-fall optimism about first quarter 1955. One even goes so far as to say "With the volume of orders we've been getting, I just can't see how Detroit figures it will build 5.6 million cars."

When the final figures are in, the stamping industry is expected to show a 30-35% decline in business between 1954 and 1953. Defense cuts are responsible for most of it.

• • •

But on the bright side of the picture, the steel-makers are doing just fine. They're operating at around 90% of capacity and, unlike the stampers, attribute increased production to Detroit demand. Sheet and strip orders are pouring in. Bar stock demand is almost as good.

Inventory readjustment is at an end, according to steel industry crystal-ball gazers.

And they think that pressure is off the specialty steel business — one of the hardest hit.

They back their prediction up with these figures: in the last two months, 500 employees have been called back at one plant, 200 at another. And several producers of stainless and special alloys are operating at 75% capacity — highest since September 1953.

Steel warehousers report a "remarkably steady year" — and they call it a freak for that reason.

They report little seasonal swing. But in the last two months, sheet and strip have been moving in progressive 10% increases.

• • •

Auto parts people report "substantially better" production in November and December of this year than in 1953. And they expect business to stay good through first half 1955. After that, business will depend on how early 1956 car models are introduced.

• • •

In the "business so-so" category are the makers of industrial fasteners, who are "mildly optimistic" for a continuing upturn. This means they expect the rising pattern of steel production to pull them along.

But third quarter 1954 was probably the worst in several years for the fastener makers (74% under third quarter 1953). Business picked up considerably in the fourth quarter, however.

Gaging Business . . .

PRICE INDEX

	NOV '54(*)	OCT '54(p)	SEPT '54(r)	OCT '53
Total Index	**132.8**	**132.8**	**132.8**	**132.5**
Metalworking Machinery	**142.9**	**142.4**	**141.7**	
Other Machinery exc. Electrical	**137.6**	**137.5**	**137.1**	
Electrical Machinery	**130.7**	**130.7**	**131.7**	
Fabricated Metal Products	**129.2**	**129.2**	**128.9**	

(*) Estimated (p) preliminary (r) revised

The employment picture is pretty mixed up just now — industrial employment is on the increase, but so is overall US unemployment.

Nonfarm employment reached a new high for the year in November, reflecting a substantial gain in auto industry jobs and in seasonal retail store hiring.

But total employment in November dropped off 410,000 from October to 61.7 million — mostly a seasonal fall-off in the farm labor force.

November unemployment increased 152,000 over the October figure. The number of people without jobs is about 1.2 million more than it was a year ago.

• • •

Personal income picture is cloudy, too. Nonfarm income for the first 10 months of 1954 was at an annual rate of $285.5 billion — almost the same as for 1953.

But farm income dropped off between September and October, causing total US personal income to drop slightly in October.

After seasonal adjustment, manufacturers' new orders dropped off 2% in October. But both months recorded a heavy order volume — mainly because of placement of large defense contracts with transportation equipment producers.

• • •

Manufacturers' sales increased in October, but the gain was slightly less than normal for the month. Although October's sales of $24.6 billion were $200 million higher than September's, sales were actually off 1% after seasonal adjustment. And they were $2.2 billion less than in October 1953.

• • •

Manufacturers' inventories moved up slightly in October. Durable goods inventories were up $250 million, with most of the increase attributable to the introduction of 1955 passenger car models.

Backlogs, too, rose slightly in October, for the second successive month. Increases centered in durable goods.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	133.5	132.4	127.1
Steel ingot production (thousand tons)	1,944	1,941	1,955
Electric power output (million Kilowatt hours)	9,612	9,087	8,582
Production of automobiles and trucks	169,438	134,858	123,148
Engineering construction awards (*Eng. News-Record*, millions)	$258.3	$302.8	$254.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	272	257	231
Vacuum cleaners sales (thousands of units)	238	185	227
Washers sales (thousands of units)	380	293	341
Household electric ranges sales (thousands of units)	100	76	84
Radio production (thousands of units)	931	785	1,217
Television production (thousands of units)	948	633	770
Gear sales index (1947-49 = 100)	135.1	154.7	135.6
Foundry equipment new orders index (shipments, 1947-49 = 100)	68.3	75.6	127.7

* Seasonally adjusted

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Metal Goods Corporation

CONNECTICUT
Hartford
The Am. Steel & Alloys Corp.
Peter A. Frasse & Co., Inc.

GEORGIA
Atlanta
J. M. Tull Metal & Supply Co.

ILLINOIS
Chicago
Central Steel & Wire Co.
Chicago Steel Service Co.

LOUISIANA
New Orleans
Metal Goods Corporation

MAINE
Auburn
Brown-Wales Company

MARYLAND
Baltimore
Seaboard Steel & Iron Corp.

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Cambridge
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Industrial Steels, Inc.
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Co-determination

The Europeans have a word for it. They call it co-determination.

Co-determination is a fancy name for "co-management." The word was being bandied about freely at least two years ago in West Germany, where it seemed to be gaining some standing in the steel industry.

It meant that the unions wanted representatives on the boards of directors of companies with which they had contracts. It meant also that the unions wanted to help managements run their businesses — not merely give them advice.

Now we see the issue of co-determination cropping up in the automobile industry at Detroit. Nowhere in the statements of the United Automobile Workers does the word appear, but the principle is there just the same.

Walter Reuther had demanded for his union an equal voice with management in deciding upon the location of new plants. He has singled out automation for special attack and has specified that automated equipment should be installed in automobile plants only in periods of expanding markets when other jobs would be available for displaced workers.

While Mr Reuther has not gone so far as to say that co-determination is his objective, it obviously is. He is rapidly branching out his interests from wages, fringe benefits and working conditions to embrace management functions. It seems that he would like management to be a cooperative affair between company officers and union officials.

This action raises a question much broader and more fundamental to American industry than the attitude to be assumed toward automation. It is: Who is going to operate a company, the management or the union? Is Mr Reuther prepared to advocate publicly that the operation of automobile companies should now become a joint enterprise?

Are the demands of the union preliminary to discussion of new automobile contracts merely a skirmish leading up eventually to open espousal of co-determination?

In view of the position already taken by Mr Reuther, the answers to these questions are that co-determination is the final objective. How can one give any other answer on the basis of the demands pertaining to automation alone?

Constant improvement in manufacturing techniques has long been a cardinal principle of automotive managements. New machines are being installed as soon as they are developed if they will increase productivity, slash costs and result in a better product.

This sort of thing has gone on for years. Mr Reuther recognized it in his 1951 contract which subscribed to the benefits arising from technological advancements.

Yet, suddenly in 1954, he in effect repudiates his former stand, or at least radically modifies it. He says that installation of improved machinery is all right if its timing is controlled. But it must not be installed at any particular time, he warns, unless the union gives the nod.

This represents a clear invasion of the functions of management. Men responsible for efficient production and for the profits and losses of a business are asked to share with the union the determination of when and where to reduce costs.

Whatever the outcome of this bid for new power by Mr Reuther and his union, it will have far-reaching effects throughout the metalworking industries. For what Mr Reuther is proposing is to tamper seriously with an economic system that has given American workmen a standard of living unrivaled in history.

Before he pushes too hard for his proposal, and before any automobile company agrees to it, we hope that both sides will consider gravely the possible ultimate consequences.

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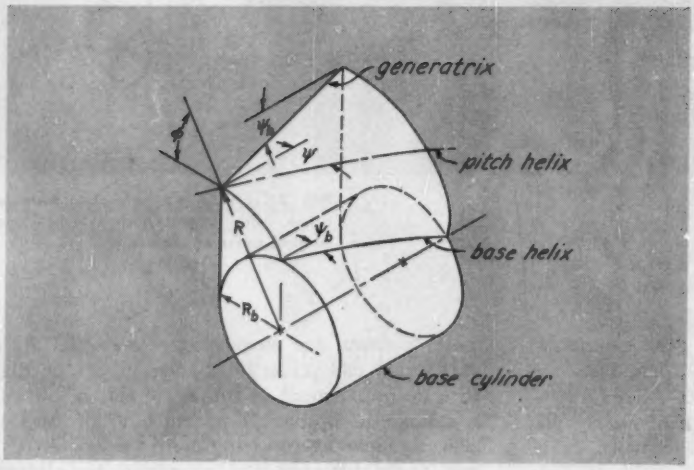

FIG. 1 . . . Generating an involute helicoid with a tape unwinding from a cylinder

How to calculate "Metal-to-metal" involute gears

Spur and helical gears can operate on parallel or skewed axes. For the four situations involved, the author provides 19 formulas, and he works out four numerical examples to determine the tooth-thickness factor. Calculations of this type are of particular importance to the designer of hobs for gears that will be shaved and to the designer of the shaving cutters. But in any case where gears roll without backlash, the gear man must know the relationship between the tooth thickness and center distance

OLIVER SAARI, development engineer, Illinois Tool Works, Inc

Gears are rolled without backlash, or "metal-to-metal," in at least two important applications: in inspection, where production gears are rolled in spring-loaded mesh with accurate master gears, and in the gear-finishing process known as "shaving." In both cases, it is important to know the relationship between tooth-thickness and center distance of the gears.

Although in each of these applications the gears are rolled without backlash, there are some important differences. Master gears are usually rolled on parallel axes. Their action can be analyzed two-dimensionally in the plane of rotation. Shaving cutters, however, must operate on skewed axes. Analysis of the tooth action must be carried out in three dimensions.

A clearer understanding generally results if problems which seem to be separate are found to have a common solution. Such a solution exists for the problem of tooth-thickness *vs* rolling position of a pair of metal-to-metal involute gears. First, how-

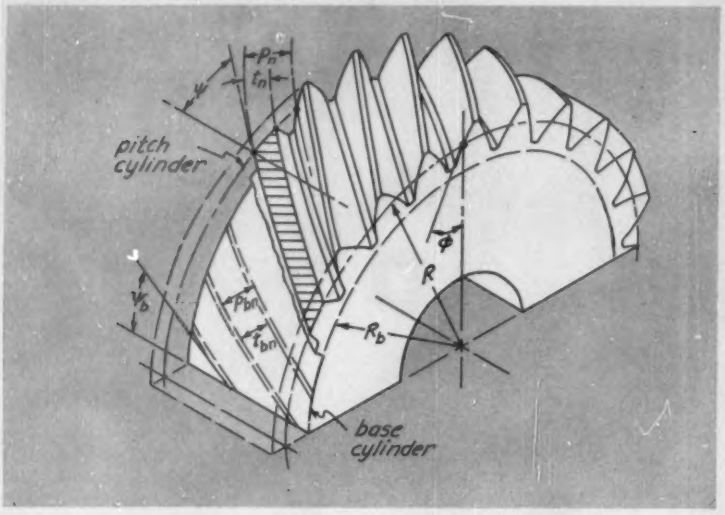

FIG. 2 . . . Definition of gear tooth parts

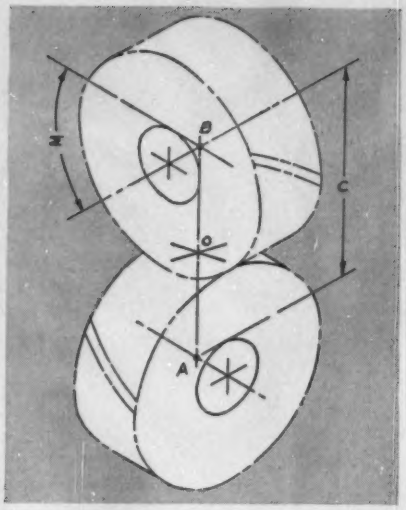

FIG. 3 . . . Skew-axis involute metal-to-metal action, with tangent pitch cylinders and symmetrical paths of contact

ever, a brief description of involute gear geometry will be helpful in understanding the formulas.

Fig. 1 shows the significant parts of an involute-helicoidal surface, on which the teeth of nearly all helical gears are based. A spur-gear tooth is a special case where the helix angles are zero, but the same concepts and nomenclature apply. Note that the involute-helicoidal surface is swept out by the end of a tape unwinding from a cylinder. The parameters fully describing an involute-helicoidal surface are the base radius R_b and the base helix angle ψ_b.

Fig. 2 shows how these involute parameters are applied to actual gear teeth. Here additional symbols must be introduced to give the relation of one side of the tooth to the other, as well as the angular spacing of the teeth. These can be completely described by giving the normal base tooth-thickness t_{bn} and the normal base circular pitch p_{bn}. *These* are measured in the developed view of the base cylinder, perpendicular to the intercepts of the involute-helicoidal gear teeth.

In studying the co-action of two gears, "pitch" parameters are introduced which are less fundamental. These can depend on an arbitrary choice of "pitch radius" at which the gear teeth are to be measured, or which is defined in some way by the generating tool. When gears are rolled "metal-to-metal," the pitch diameters as well as the rolling positions depend on tooth-thickness relationships and are generally the unknown quantities to be solved.

If a pair of involute gears are to have true conjugate action, their normal base pitches must be equal. This is a "universal law" of involute gearing, whether operation is on parallel or skew axes. Aside from this restriction, however, involute gear tooth systems are surprisingly versatile. Parallel-axis gears can undergo change in center distance with no impairment of conjugate action, but merely a change in operating pressure angle and backlash. In skew-axis gearing, both the center distance and angle between the axes can be altered independently, while still maintaining correct conjugate action. There are, however, changes in tooth action which must be considered when using shaving cutters, as follows:

Skew-axis involute gears have theoretical point contact. This is spread into limited surface contact only by wear and elastic deformation. The locus of theoretical contact points is a straight line, which is always tangent to both base cylinders. In metal-to-metal gears there are *two of these paths of contact* — one for each side of the tooth. Standard design formulas give gears whose paths of contact pass through a common point on the line of centers, or the common perpendicular "shortest distance" between the axes of the gears. This point is called the *pitch point*. Metal-to-metal tooth action of this type will henceforth be called *symmetrical*, and is illustrated in Fig. 3. Line AB is the line of centers and point *O* is the pitch point, at which helical traces of the teeth are co-directional. If the center distance is changed without changing the axis-angle, conjugate action remains correct, but the paths of contact shift so that they no longer pass through the line of centers. In this case the operating pressure angles do not change. If the axis-angle is changed, the paths of contact are shifted, and also the operating pressure angles are changed. If the tooth-thickness of one of a pair of symmetrical-acting gears is changed, the resulting change in backlash can be compensated for by either or both of the above changes in axis position.

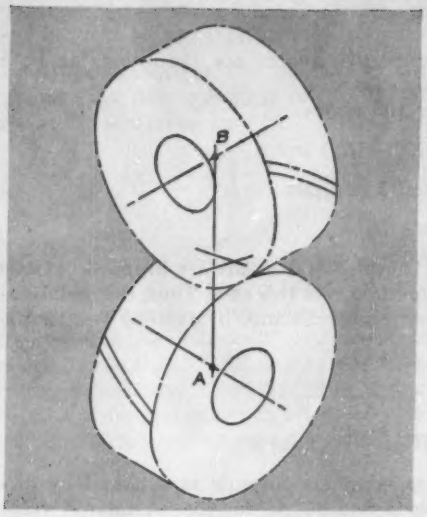

FIG. 4 . . . Metal-to-metal action with unsymmetrical paths of contact

NOMENCLATURE

C = center distance
Σ = axis-angle
p_{bn} = normal base pitch
P_n = normal diametral pitch
B_n = normal circular backlash
t = tooth-thickness factor

In using the following symbols, subscripts (1) and (2) have been added to refer to the two gears under consideration:

R_b = base radius
N = number of teeth
ψ_b = base helix angle
t_{bn} = normal circular base tooth-thickness
R = pitch raduis
ψ = pitch helix angle
ϕ = transverse pressure angle

Pathss of contact which do not pass through the line of centers are illustrated in Fig. 4. This type of action is unsatisfactory for gear-shaving cutters, because twisting moments are set up which produce helix errors in the gear being shaved. It is easy to design a cutter to operate at a predetermined center distance with symmetrical action. However, the cutter must be sharpened by grinding away material from its involute surfaces, thus reducing its tooth-thickness. If metal-to-metal action is obtained by simply shortening the center distance, the paths of contact cannot remain symmetrical.

Symmetrical tooth action can be obtained by *also* changing axis-angle. This problem is usually solved by trial in the shop. An analytical solution for the exact axis position can be of value in assuring correct action at all times. Knowledge of the range of cutter positions is also important to the designer of the shaving cutter, and to the designer of the hob which makes the gears to be shaved. A solution of this problem now follows:

All *symmetrical* metal-to-metal tooth action satisfies two mathematical relationships,

$$\sin \phi_2 = \left(\frac{\cos \psi_{b1}}{\cos \psi_{b2}}\right) \sin \phi_1 \quad \text{..... (1)}$$

$$t = N_1 \text{ inv } \phi_1 + N_2 \text{ inv } \phi_2 \quad \text{..... (2)}$$

where t is the *composite tooth-thickness factor* for the pair of metal-to-metal gears, having a value given by

$$t = \frac{\pi}{p_{bn}} (t_{bn1} + t_{bn2} - p_{bn}) \quad \text{..... (3)}$$

For any pair of gears, t has a value depending on tooth-thickness measurements, and equations 1 and 2 solved simultaneously give the transverse pressure angles for symmetrical metal-to-metal action. These equations hold as well for parallel-axis gears, which can be considered a special case of symmetrical metal-to-metal action. The equations can be derived algebraically by rearranging the well-known gear design formulas.

One great convenience of these formulas arises from the fact that a change in tooth-thickness of either gear causes a very easily determined change in the factor t. Tooth-thickness measurements of gears are conveniently related to pitch cylinders of "standard" dimensions, where the normal diametral pitch P_n and the transverse pressure angles ϕ_1 and ϕ_2 are already known. If the normal circular tooth-thicknesses of the gears as measured add up exactly to the normal circular pitch, then the gears will operate metal-to-metal with symmetrical action at these standard pitch radii. If, however, the measurements show that a certain amount of normal circular backlash B_n exists at these pitch cylinders, then the actual tooth-thickness factor differs from "standard" by

$$\Delta t = - B_n P_n \quad \text{..... (4)}$$

Thus it is seen that equations 2 and 4 can always be used to obtain t, provided tooth-thickness measurments are always made at the known standard pitch cylinders. Equation 3 may be used for checking purposes only, if desired.

The use of equations 1, 2 and 4 can sometimes be much simplified. It is convenient to separate the various possibilities into four general classifications, and to rearrange the equations into the most convenient form for each. These four cases are:

CASE I—Spur gears rolling on parallel axes.
CASE II—Helical gears rolling on parallel axes.
CASE III—Helical gears rolling on skew axes, base helix angles equal.

CASE IV—Helical gears rolling on skew axes, base helix angles unequal.

In what follows, primes are used to avoid the confusion of too many symbols. The symbols without primes, such as ϕ_1, ϕ_2, ψ_1, ψ_2, C, etc., refer to the known "standard" conditions on which the design of the gears is based and at which tooth-thickness measurements are made. The same symbols with primes such as ϕ'_1, C', etc., refer to the non-standard symmetrical metal-to-metal rolling conditions being solved for. Thus it is seen that

$$t' = t - B_n P_n \quad \text{..... (5)}$$

This is the first step to be used in solving for the metal-to-metal condition from a known amount of normal circular backlash (or interference) at standard conditions. This new tooth thickness factor t' is put into equation 2, giving the following simultaneous relationships between the unknown transverse pressure angles:

$$\sin \phi'_2 = \left(\frac{\cos \psi_{b1}}{\cos \psi_{b2}}\right) \sin \phi'_1 \quad \text{..... (6)}$$

$$N_1 \text{ inv } \phi'_1{}' + N_2 \text{ inv } \phi'_2{}' = t' \quad \text{..... (7)}$$

Solution of equations 6 and 7 gives the transverse pressure angles ϕ'_1 and ϕ'_2, from which the corresponding helix angles, axis-angle, and center distance can be computed as follows:

$$\tan \psi'_1 = \tan \psi_{b1} \sec \phi'_1 \quad \text{..... (8)}$$
$$\tan \psi'_2 = \tan \psi_{b2} \sec \phi'_2 \quad \text{..... (9)}$$
$$\Sigma' = \psi'_1 + \psi'_2{}' \quad \text{..... (10)}$$
$$R'_1 = R_{b1} \sec \phi'_1 \quad \text{..... (11)}$$
$$R'_2 = R_{b2} \sec \phi'_2 \quad \text{..... (12)}$$
$$C' = R'_1 + R'_2 \quad \text{..... (13)}$$

This is the general solution to the problem, applying to all types of symmetrical involute gear tooth action, including the special case of parallel axes. In a case where the "standard" dimensions of the gears are not known (although, of course, the base pitches must be known to be equal), the tooth thickness factor t can be determined by measuring the gears and applying equation 3. The symmetrical metal-to-metal rolling position can then be obtained from the other equations.

The simultaneous solution of equations 6 and 7 for the pressure angles is the only part of the computation that can involve any unusual difficulties, and even it does so only in Case IV. These difficulties are removed by a simple, practical approximate solution.

Separate discussions of the four cases with numerical examples of each now follow:

CASE I—Spur gears rolling on parallel axes

By definition:

$$\Sigma = \psi_1 = \psi_2 = \psi_{b1} = \psi_{b2} = 0$$

and also

$$\phi_1 = \phi_2 = \phi$$

where the identifying subscripts can be dropped because the pressure angles are the same for both gears in this case.

Equation 2 becomes

$$t = (N_1 + N_2) \text{ inv } \phi$$

and equation 5 becomes

$$t' = t - BP$$

where the "normal" subscripts are dropped because they are superfluous in this case. Thus, the metal-to-metal rolling center distance is given by two simple formulas:

$$\text{inv } \phi' = \frac{t - BP}{N_1 + N_2}$$

$$C' = (R_{b1} + R_{b2}) \sec \phi'$$

A simple approximate formula is obtained by differentiating to find dC/dB for the "standard" value of pressure angle, and assuming this rate to be constant throughout the range of B. Thus,

$$\Delta C \text{ (approx.)} = -\tfrac{1}{2} B \cot \phi$$

This formula gives results accurate enough for almost any master-gear inspection setup.

As a numerical example of Case I, let $N_1 = 25$, $N_2 = 40$, $P = 8$, $\phi = 20°$, $R_1 = 1.5625$, $R_2 = 2.500$, $C = 4.0625$ — these being the given standard conditions. Thus equation 2 gives

$$t = 65 \text{ inv } 20° = 0.96879$$

which is the "standard" tooth-thickness factor. For sake of definite example, let the backlash at the standard pitch radii be $B = 0.010$. Then:

$$t' = 0.96879 - (0.01)\ (8) = 0.88879$$

which is the "corrected" tooth thickness factor. Putting this in the above equations gives $\phi' = 19.4516°$, $C' = 4.04853$, and ΔC (exact) $= -0.01392$. The approximate formula gives a value of -0.01374 in this case, an error of only 0.00018.

CASE II—Helical gears rolling on parallel axes

Here again the axis-angle is zero and there is no change in it. The helix angles (both pitch and base) are equal but of opposite hand. The transverse pressure angles in all rolling positions are equal. This leads to the same formulas as Case I, except that now the corrected tooth-thickness factor is given by the normal diametral pitch and normal circular backlash, thus

$$t' = t - B_n P_n$$

The approximation formula in this case, in every way analogous to Case I, is

$$\Delta C = -\tfrac{1}{2} B_n \cot \phi_n$$

CASE III—Helical gears rolling on skew axes, base helical angles equal

From equation 1 it is seen that the transverse pressure angles must always be equal. Equations

8 and 9 show that the pitch helix angles are also equal. Thus, the formulas are identical to those of Case II, except that in this case the axis-angle also changes. The new operating pitch helix angles and axis-angle are given by

$$\tan \psi' = \left(\frac{\cos \phi}{\cos \phi'}\right)\tan \psi$$

$$\Sigma' = 2\psi'$$

As a numerical example, let $N_1 = 25$, $N_2 = 40$, $\psi_1 = \psi_2 = 45°$, $P_n = 8$, $\phi_n = 20°$, $\Sigma = 90°$. The transverse pressure angle at the standard pitch diameter of both gears is $\phi = 27.2363°$, and the standard center distance is $C = 5.7452$, as obtained from the usual design formulas. From equation 2, $t = 2.55894$. For sake of definite example, let $B_n = -0.01$ (in this case an interference rather than a backlash). Then

$$t' = 2.55894 + (8)\ (0.01) = 2.63894$$

$$\text{inv } \phi' = \frac{t'}{N_1 + N_2} = 0.0405991$$

$$\phi' = 27.4995°$$

$$\tan \psi' = \left(\frac{0.8891265}{0.8870149}\right)(1) = 1.0023805$$

$$\psi' = 45.0681 \text{ deg.}$$

$$\Sigma' = 90.1362 \text{ deg.}$$

Calculating the new rolling pitch radii for the metal-to-metal symmetrical condition and adding gives the exact center distance $C' = 5.7589$. Thus, the change in axis angle $\Delta\Sigma = +0.1362$ deg. and the change in center distance $\Delta C = +0.0137$.

CASE IV—Helical gears rolling on skew axes, base helix angles unequal

In this case the simultaneous solution of equations 6 and 7 is difficult because the pressure angles are unequal, and no simple algebraic relation exists between the sine and involute functions. Solutions can be obtained, of course, by trial and error. Differentiation with respect to the factor t aids greatly in finding the exact solution by trial. Moreover, the derivatives are very nearly constant in any practical range of solutions, leading to simple and useful approximation formulas. The derivatives are as follows:

$$d\phi_1/dt = \frac{\tan \phi_1 \cot^3 \phi_n}{N_1 \sec^3 \psi_1 + N_2 \sec^3 \psi_2} \quad \text{..... (14)}$$

$$d\phi_2/dt = \frac{\tan \phi_2 \cot^3 \phi_n}{N_1 \sec^3 \psi_1 + N_2 \sec^3 \psi_2} \quad \text{..... (15)}$$

$$d\psi_1/dt = \frac{\tan \psi_1 \cot \phi_n}{N_1 \sec^3 \psi_1 + N_2 \sec^3 \psi_2} \quad \text{..... (16)}$$

$$d\psi_2/dt = \frac{\tan \psi_2 \cot \phi_n}{N_1 \sec^3 \psi_1 + N_2 \sec^3 \psi_2} \quad \text{..... (17)}$$

$$d\Sigma/dt = d\psi_1/dt + d\psi_2/dt \quad \text{..... (18)}$$

The solution begins as before with finding the tooth-thickness factor t and normal circular backlash B_n at the known standard conditions. Then the change in the tooth-thickness factor, Δt, is computed from

$$\Delta t = -B_n P_n \quad \text{..... (19)}$$

Equations (14) through (18) are solved for the derivatives at the standard conditions. These values, multiplied by Δt, give the resulting changes in pressure, helix, and axis angles, the units being in *radians*. It should be noted that for a positive amount of backlash, these changes are all negative and should be converted to degrees and subtracted from the standard values. A numerical example follows:

Let $N_1 = 25$, $N_2 = 40$, $P_n = 8$, $\phi_n = 20°$, $\psi_1 = 20°$, $\psi_2 = 10°$, $\Sigma = 30°$. The "standard" values are $C = 4.2013$ and $t = 1.06764$. The derivatives computed from these values are $d\phi_1/dt = 0.11156$, $d\phi_2/dt = 0.10645$, $d\psi_1/dt = 0.01389$, $d\psi_2/dt = 0.00673$, $d\Sigma/dt = 0.02061$.

For definite example, let $B_n = 0.01$; then $\Delta t = -0.08$.

For convenience, all the radian derivatives should first be multiplied by 57.29578, which will convert them into degrees, then multiplied by -0.08 to give the changes in the pressure and helix angles. The new values thus come out to be $\phi_1' = 20.6615$ deg., $\phi_2' = 19.7957$ deg., $\psi_1' = 19.9363$ deg., $\psi_2' = 9.9692$ deg., $\Sigma' = 29.9055$ deg., $C' = 4.1878$.

These values are close approximations, analogous to the approximation given in Case I. If greater accuracy is desired, the approximate pressure angles should be used to obtain a new tooth-thickness factor from equation (7). In this example the factor comes out to be $t' = 0.9897$, which amounts to a change from t of -0.0779, or 0.0021 short of the desired value of -0.08. This means that the derivatives should have been multiplied by -0.0821 to obtain much more exact values. (The derivatives themselves need not be recalculated because they do not change rapidly.) This operation gives values exact enough for any purpose, these new values being $\phi_1' = 20.6480$ deg., $\phi_2' = 19.7829$ deg., $\psi_1' = 19.9347$ deg., $\psi_2' = 9.9684$ deg., $\Sigma = 29.9030$ deg., $C' = 4.1875$. These values are exact to the number of decimal places to which they are carried out. The fact that they represent the symmetrical metal-to-metal rolling position can be verified by subjecting them to the customary gear-design calculations. It should be observed that in this case at least the first approximation was not very much in error.

One word of caution may be order: in some cases of shaving cutters, the helix angles of the gear and cutter my be of opposite hand. The foregoing formulas give correct results if these helix angles are given opposite signs, the larger being considered positive, to result in a positive axis-angle, and the smaller being considered negative. The conventions in using plus and minus signs should be adhered to in all the calculations.

Cope Talks on Draw Dies...XXII

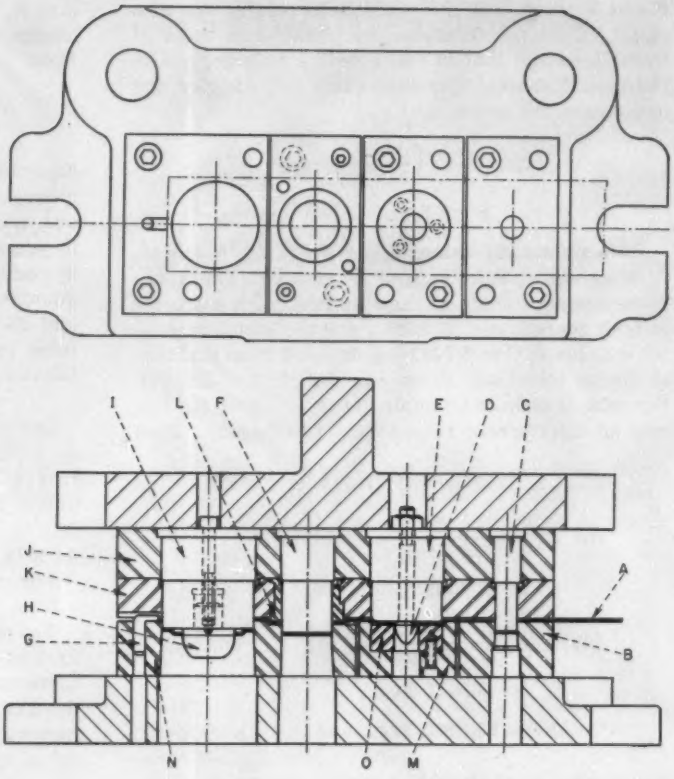

FIG 1 ... Shallow shells may be produced in progressive dies by proper attention to piloting. Die block is made in three pieces to permit sharpening cutting edges without disturbing the forming steel

Make small shells

Strip is the convenient material for making small drawn articles in quantity. You have a choice of seven methods of drawing shells progressively, to be described in this and a succeeding installment

Shells too small to be handled in separate dies should be made progressively in one operation, especially if they are required in large quantities.

There are seven general methods of drawing shells progressively in the strip.

If a shell is very shallow and can be stamped without drawing metal from the outside of the blank, it may be produced in a die similar to that shown in Fig. 1. This die has four stations in all.

Operation of the die is: Strip *A* is placed on die *B* and is fed across the die to the first sight line (not shown). The press is then tripped. Punch *C* pierces a hole, which serves both as a pilot hole and strain-relief hole in the second station. The strip is then advanced to the second sight line and the press is tripped again. Pilot *D* enters the previously pierced hole to align the strip, and punch *E* stamps the shell. The hole become slightly larger during this

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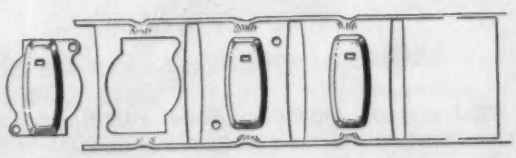


FIG 2 ... Slits just inside the strip edge and between blanks provide flexibility so that the square blank can be drawn without restraint by the side rails

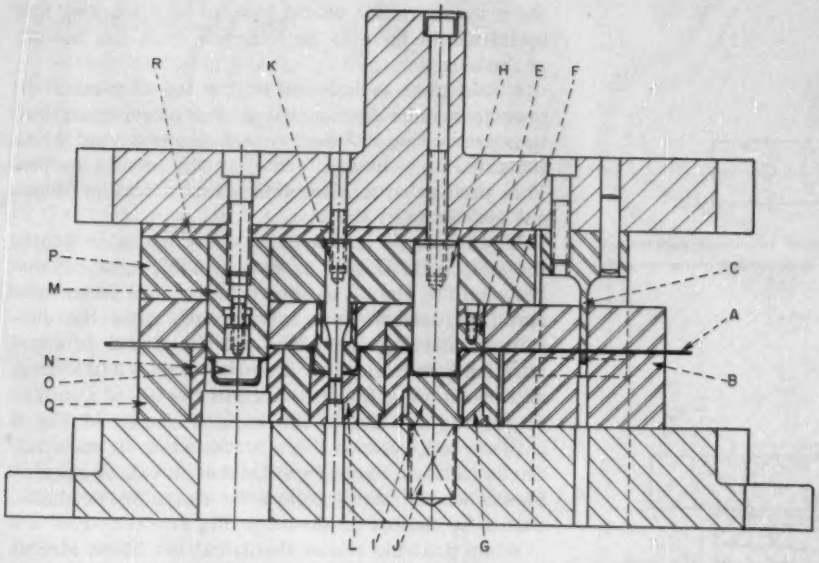


FIG 4 ... Drawing punches can be adjusted to strike harder, if necessary, and the cutting punches can be shimmed to compensate for sharpening

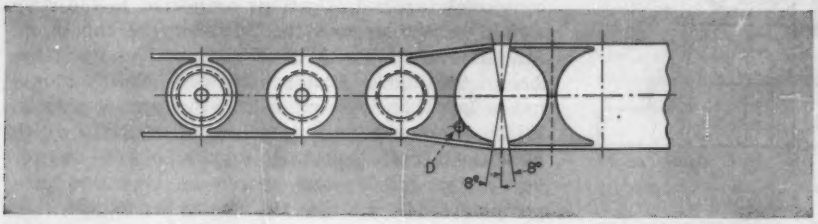


FIG 5 ... Strip *A* is fed across die *B*, Fig 4, to the dashline indicated, so that half of the first blank is cut. Then, the strip is advanced to pin *D*, and on the next stroke, the remaining half of the first blank is cut and one half of the second blank

in progressive dies

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, IND

operation. In the third station the hole is re-pierced to size. The strip is then advanced up to stop pin *G*. In the fourth and last station, pilot *H* enters the hole and punch *I* blanks the shell.

Punches *C*, *E*, *F* and *I* are provided with heads and are retained in plate *J*. The cutting punches are extra long. When new, they enter the die ¼ in. This provides metal for sharpening them when they become dull. This precaution is necessary when the stripper bottoms and the slide of the press cannot be adjusted downward to compensate for punches shortened by grinding.

Spring stripper *K* is made of hardened and ground tool steel. In addition to stripping the work from the punches, it holds the strip flat and under control while the shell is being stamped. It bottoms on the punch plate at the end of the stroke to set the radii and stamp the flange parallel with the bottom of the shell. Insert *L* is provided at the third station to fit inside of the shell, while the hole is repierced.

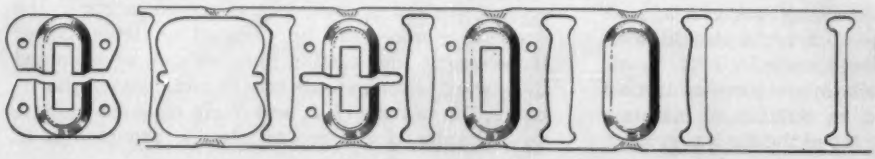


FIG 3 ... Cutouts almost surrounding the blank are preferred for thicker stock or where the blank outline should closely approximate the shape of the shell

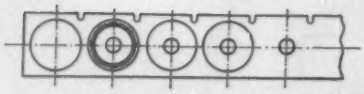


FIG 6 . . . Blanks can be severed by about two-thirds penetration by the punch, pushed back in the strip and carried along through a progressive die

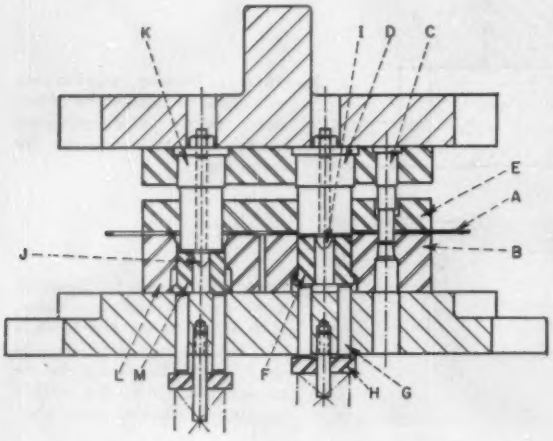


FIG 7 . . . Pad *F* pushes the blank back into the strip at the second station, so that it can be carried by the strip to the fourth station, where drawing takes place

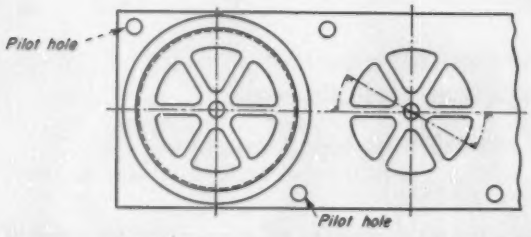


FIG 8 . . . A shallow shell with an inverted bottom can be made in a progressive-combination die, if succeeding operations will not distort holes pierced while the blank is flat

The die block is made in three pieces to permit sharpening the cutting edges without disturbing the forming steel. These three pieces are shown at *B*, *M* and *N*. A step is machined on piece *N* to provide cutting levels for both piercing and blanking operations. Insert *O* in drawing die *M* permits adjustment if the bottom of the shell must be struck harder after trial shells have been made.

If the die block were made in one piece and insert *O* omitted, the die would be difficult to maintain and sharpen. Each time the top of the die was ground, the drawing radius would have to be reworked, and metal would have to be removed from the bottom of the hole.

A thin plate is fastened on the top of piece *N* to provide a close-fitting nest in the piercing station, thus preventing the shell from being distorted when the preceding shell is formed in the second station. This precaution is advisable when a section is not cut out between the blanks.

When a shell is drawn to a considerable depth, the strip must be slit, as shown in Fig 2, or cut out between the blanks, as shown in Fig 3, to permit the metal to flow without interference from the side rails connecting the blank. If the metal is comparatively thin, say less than No. 20 ga. (0.0359 in.), and the shape of the shell permits the use of a square or rectangular blank, the method shown in Fig 2 is preferred, because there is less waste of material. Shells that are made from thicker metal, or require blanks which closely follow the shape of the shells, should be cut out as shown in Fig 3.

When drawing round shells, cut the blank almost completely around. Portions connected to the strip should extend around the periphery of the blank for not more than 15 to 20°, depending upon the size of the blank. Distance between blanks should not be less than 1/16 in., or 2*t*, whichever is greater. Width of the side rails (portions of the strip which hold the blanks together) should be 3/64 in. for very small blanks, and should be increased proportionately in width as the blanks increase in size.

When it is necessary to cut out a section between the blanks, dies should be of a design similar to that shown in Fig 4. With this die, strip *A* is fed across die *B* to the position indicated by the dash line in Fig 5. The press is then tripped, and punch *C* cuts one-half of the first blank. The strip is then advanced to pin *D*. When the press is tripped the second time, the remaining half of the first blank is cut, in addition to one-half the entire die hole, so that punch *C* will not cut on only one side. When the strip covers the die hole the first blank is wasted and must be removed from the strip before the blank is advanced to the drawing station.

The blank is lifted over pin *D* and the strip is advanced to the second station. In this station the blank is gripped between hardened insert *E*, which is fastened in spring stripper *F*, and the die button *G*, and is drawn into the desired shape by punch *H*. When punch *H* rises, pad *I*, which is backed by spring *J*, ejects the shell from the die.

In the third station, a hole is pierced in the bottom of the shell by punch *K* and die button *L*. In the fourth station the shell is blanked from the strip by punch *M* and die N. Pilot *O* enters the shell to center it prior to the blanking operation.

Punches *H*, *K* and *M* are retained by screws in punch plate *P*. When the punches are retained by screws, instead of shoulders as shown in Fig 1, the drawing punches can be adjusted to strike harder if necessary, and cutting punches can be shimmed downward to compensate for the metal lost in sharpening. Die buttons *G*, *L*, and *N* are retained in plate *Q*. A hardened and ground plate is provided at *R*.

BLANK AND PUSH-BACK DIES

Another method, which is frequently used to hold blanks in the strip while various operations are performed on them, is to shear the blanks completely out and then force them back into the strip, as shown in Fi. 6. When this method is used, the blanks should be fairly thick, in comparison with their size, so that they may not fall from the strip when they are moved from station to station. When the metal is less than 1/32 in. thick it is difficult to keep a very small blank in the strip.

More stock than normally provided for plain blanking operations should be allowed between the blanks and at the sides of the strip to make the strip rigid. If the bridges are too narrow, the strip will bend and cause the blanks to fall out. If more than one idler station is necessary between the blanking and drawing stations of the die, or if other operations are performed after the blank has been cut, the blanks should be pushed back tightly in the strip between hardened blocks.

A typical die that employs the push-back principle is shown in Fig 7. In operation strip *A* is laid cn die *B* and is pushed to an automatic side-acting stop (not shown). The press is then tripped and punch *C* pierces a hole. Another punch (not shown) cuts a notch for gaging. The strip is then advanced to the second station where the blank is cut by punch *D*. The punch is permitted to penetrate the stock only to a depth of about two-thirds of its thickness, or to a point where the blank is completely fractured from the strip. If the blank is pushed entirely from the strip it will be difficult for it to re-enter. When punch *D* rises, spring stripper *E* holds the strip flat against the die, while pad *F*, which is actuated by pins *G* and pressure attachment *H*, pushes the blank back into the strip. Before the blanking operation, pilot *I* enters the previously pierced hole so that the blank will be cut central with the hole.

The third station is an idler to permit sufficient strength in the die between the blanking and drawing stations. In the fourth station, pilot *J* enters the hole in the blank and punch *K* pushes the blank out of the strip into die *L*, which draws it into a cup.

Mouth of die *L* is shaped to permit the blank to be pushed clear of the strip before the sides of the cup start to form. If this precaution is not taken the edges of the blank will enlarge the hole in the stirp as they turn upward. This effect may cause the blank in the next station to become loose. The completed stamping is returned to the top of the die by pad *M* and is pushed clear when the strip is advanced.

An automatic side-acting stop is used on dies of this type so that it will be unnecessary to raise the strip when it is being moved across the die. If an ordinary bent stop were used it would be necessary to raise the strip each time it was advanced. This could cause the sheet to bend slightly and release the blanks. Moreover, the stop would be in the way of the completed stamping, because this must ride along with the strip and be disposed of over the edge of the die.

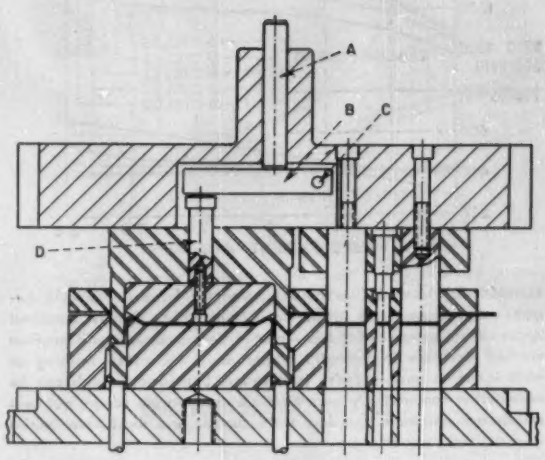


FIG 9 ... Holes are pierced in the first station of this progressive-combination die, a circumstance that limits application to shallow shells of light-gage materials

PROGRESSIVE-COMBINATION DIES

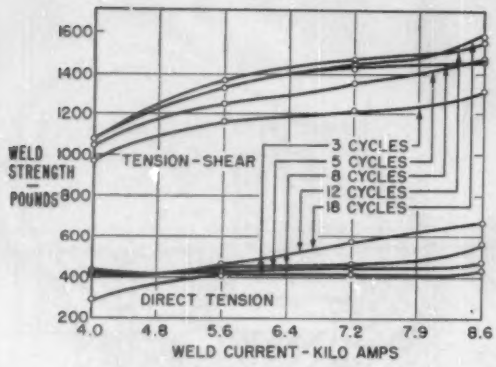
Shallow shells may have inverted bottoms, which are pierced or cut out, like the wheel for toy vehicles, Fig 8. A part like this can often be made complete in one operation in a progressive-combination die, Fig 9. With this type of die the holes are pierced in the first station. The strip is then advanced to the second station where it is blanked, drawn and stamped.

The shell must be very shallow and the bottom must be of a shape that will permit piercing the holes while the blank is flat (before forming). If the metal is too thick, or the draw is too deep, metal will be pulled from the previously pierced holes during the drawing operation, and the result may be an unsatisfactory product. In general, wide variations should be permissible in shells made by this method.

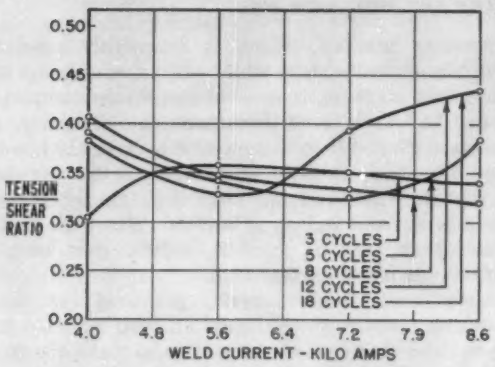
The work may be aligned between stations by providing a pilot in the drawing station of the die and piloting directly in the center hole of the piece-part, or by piloting in holes which have been pierced in the waste portion of the strip as shown in Fig 8.

A lever-type knockout is used in this die to permit placing the blanking and drawing station of the die off center, so that a smaller die set can be used, as well as to distribute the pressure evenly on both sides of the slide of the press. The knockout consists of knockout rod *A*, lever *B*, fulcrum pin *C*, and pin *D*. Dies of this type should be provided with spring strippers to strip the work from the punches.

Part XXIII of Mr Cope's series will appear in an early number.

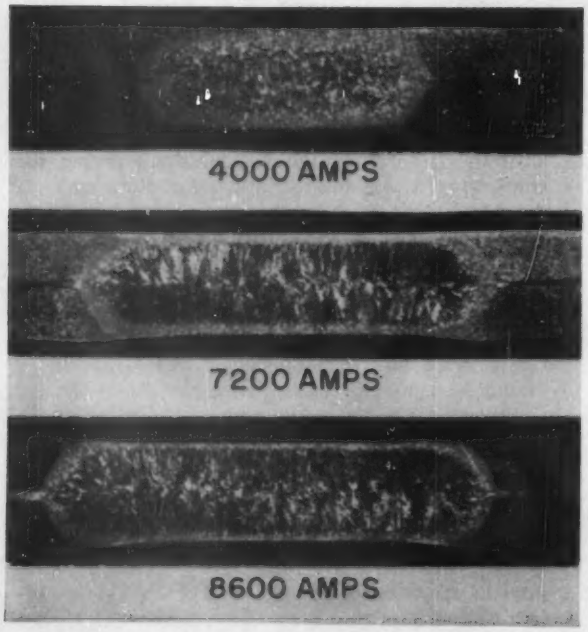


TENSION-SHEAR and direct tension strengths for variable weld currents at various weld times on 22-ga Ti75a. Curves represent approximate extremes for this material. Lower currents will produce marked decrease in strength, higher ones will cause flashing at weld interface and excessive indentation. Satisfactory welds can be obtained in commercially pure titanium over a wide range, but best results are obtained from low weld current and short times which give desired static strength



RATIO OF DIRECT TENSION to tension-shear strength is an indication of ductility. Difference in curve trends is probably attributable to erratic properties of titanium. Data indicate maximum ratio of 0.47, minimum of 0.31, average 0.36. Average is low in view of 1020 steel's average of 0.50. Aluminum 24ST has average ductility ratio of 0.35. SAE 1035 steel, spotwelded and post heat tempered, has ratio near that of Ti75a, and same general characteristics of high tension-shear and relatively high direct tension strength

Spot welds work well in titanium



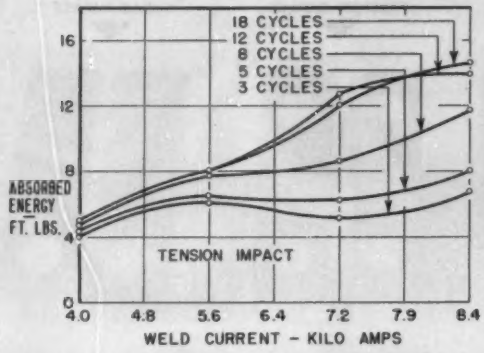
TYPICAL SPOT WELDS in Ti75a made at three cycles weld time. Note rapid increase in penetration which exceeded 80% at 5500 amp and approached 95% at 8600 amp. Note also the slight finning at the weld interface, typical of spot welds in titanium. Clearly shown are the heat-affected zone and the nugget with enlarged grain structure

Results of a research program supported by Navy Bureau of Ordnance indicate that spot welding, particularly in commercially pure titanium, is a practicable method of assembly

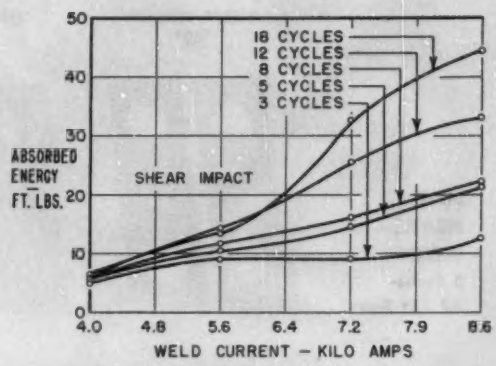
M L BEGEMAN, professor mechanical eng'rg. and
FRANK W McBEE, JR, Defense Research Laboratory
UNIVERSITY OF TEXAS

Many of the problems of welding titanium still remain to be solved, particularly in the field of high-strength alloys and in the welding of titanium to other metals. But spot welding of commercially pure Ti75a appears to be entirely satisfactory.

Data presented here were obtained with such material, except for the micrographs which were taken on Ti100a, an oxygen-nitrogen alloy having physical properties as shown in an accompanying table. Welds were made with Mallory No. 1527 (fluted RWMA Class II) electrodes having a 2-in. radius dome; cooling water rate was constant at 1.5 gpm; electrode closing rate was 3 fps; electrode stroke 0.25 in.; squeeze time 20 cycles; hold time 20 cycles.



EFFECT UPON SHEAR and impact strength of varying weld current and time. Ability of weld to absorb energy increases as the heat into the weld is increased. Extremely high shear impact values from 12 and 18 cycles were caused by sheet being too wide for the weld, so failure occurred by tearing the sheet rather than by pulling a plug. Limited tests with varying tip force indicate a desirable range between 300 and 900 lb, with 600 lb as an average. Below 300 lb, flashing occurs; over 900 lb, indentation is excessive



APPROXIMATE PHYSICAL PROPERTIES

	Commercially Pure Ti75a	Oxygen-Hydrogen Alloy Ti 100a
Hardness vhn	175	300
Ultimate strength, psi	75,000	100,000
Yield strength, psi	50,000	75,000
Elongation, %	20-30	20-25

TENSION/SHEAR RATIOS

Material	Ratio: Direct Tension Tension Shear	Tension Impact	Shear Impact
Ti75a, 24-ga, 4-cycle, 5.6-kilo amp	0.31	5.4	7.3
Ti75a, 25-ga, 4-cycle, 4.8-kilo amp	0.31	4.0	6.4

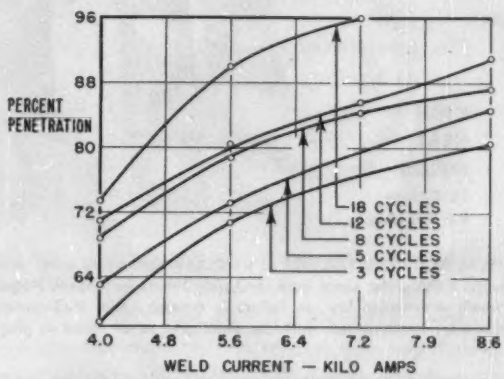
24- and 25-ga material are essentially same as 22-ga

Electrode tip force was held constant at 600 lb, except where tests were made with this as a variable.

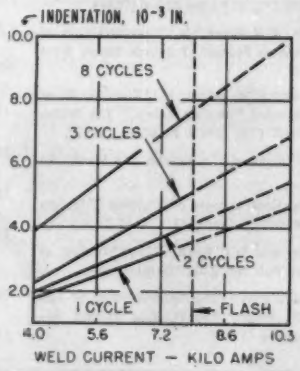
All test coupons were cleaned by degreasing with carbon tetrachloride, and no further cleaning was found to be necessary. Samples were held in a fixture to insure correct alignment, and at least three specimens were welded under each set of conditions.

In establishing the shear-tension ratios, it is to be noted that Ti75a is considered as a non-heat-treatable material, so no effort was made to post-heat or anneal to increase this ratio, even though such cold-rolled material is not considered to be in its most ductile form. Tests were run on 22-gage stock but, as shown in an accompanying table, ratios for 24- and 25-gage stock were essentially the same.

Hardness determinations were made across the weld nugget through the heat-affected zone and into the parent metal. They revealed that there is little increase in hardness, even in the nugget. Parent-metal hardness of 195 KHN (1kg load) increased to 240 KHN at the edge of the weld, and to 250 KHN at the nugget center. This increase is not sufficient to cause any concern about embrittlement. It was also found that variations in weld time, current, and tip force had no appreciable effect upon hardness.



SPOT-WELD PENETRATION is defined as the ratio, expressed as a percent, of the thickness of the weld nugget to the total weld thickness at the center of the nugget. Penetration above 80% is undesirable in most materials because it tends to produce cracks and shows excessive indentation. In commercially pure titanium, high penetration does not affect weld quality unless it exceeds 90 to 95%



EFFECT OF WELD CURRENT and time upon indentation. Avoid flashing because it increases indentation as a result of expulsion of material at interface, creates porous welds, cracks, and a generally poor appearance. Titanium can generally be welded so indentation will not exceed 8 to 10% just prior to point where flashing begins. Indentation may be critical when smooth surfaces are required, as in missiles and airfoil sections

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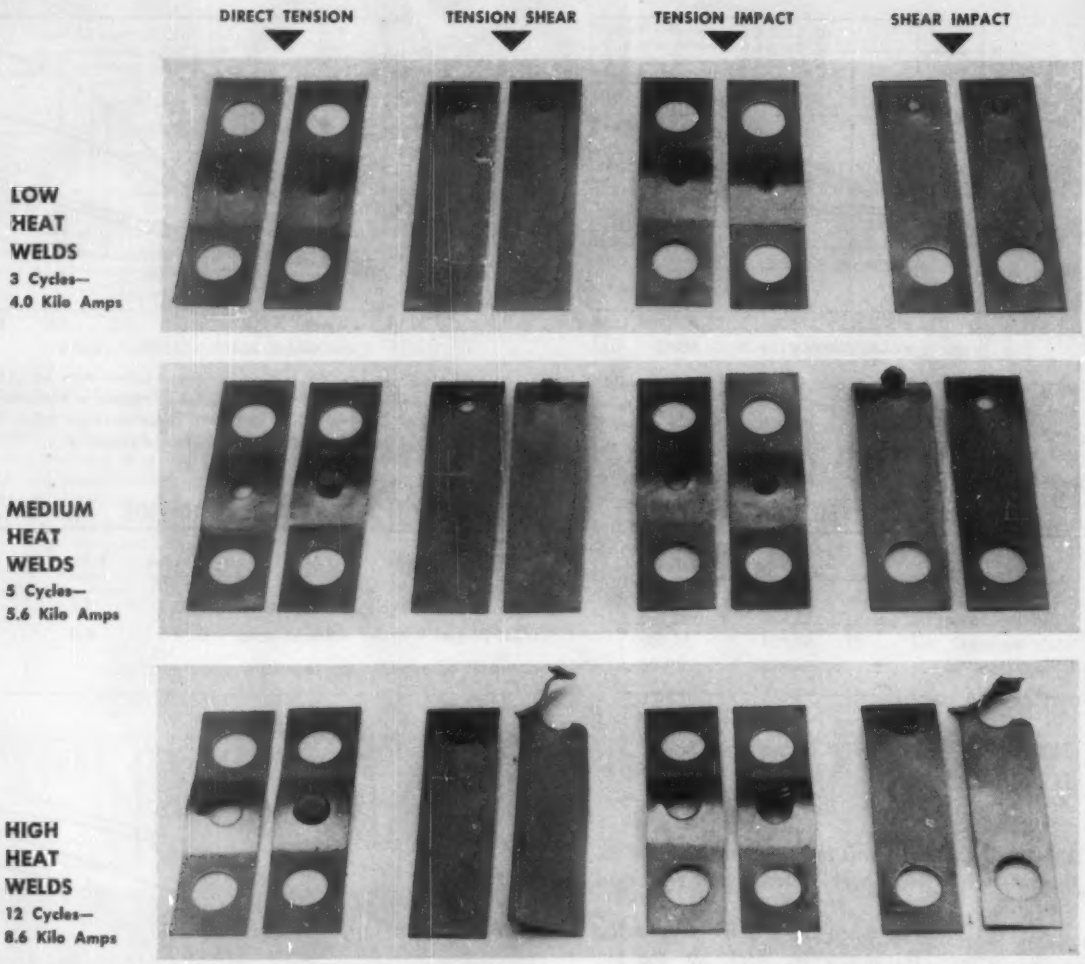

TYPICAL SPOT-WELD FAILURES in Ti100. Low-heat welds show shear through weld under shear load, and plug failure in tension. Nugget is small, penetration low, so failure is through weld. Medium-heat welds were made at near optimum conditions, so all failed as plugs. These are typical of welds of average ductility. Actual failure was near heat-affected zone, and mild finning is apparent on outside of plug. High-heat welds failed by tearing of sheet near weld. Had sheet been wider, failures would have been similar to those for medium-heat welds

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American Machinist

SPECIAL REPORT

NUMBER 382

How tools made the world in which we live

MAN emerged as a separate and unique animal perhaps a million years ago. His shorter pelvic bone permitted him to stand and to walk erect, and thus freed his hands. (The apes have "hands" too, but they still use theirs to help in walking, so they cannot hold onto tools continuously. Some, like the chimpanzee, do use a stick – even two sticks stuck together – to knock down fruit, but it is a stick they find where they are.) No animal, except man, remembers to carry his tools with him, or has the amazingly developed versatility of man's hands and arms. It is man's hands that gave him his initial superiority, that enabled him to learn to use tools. And tools not only extended his hands and widened the scope of his will, but they also made possible his tremendous development through the milleniums.

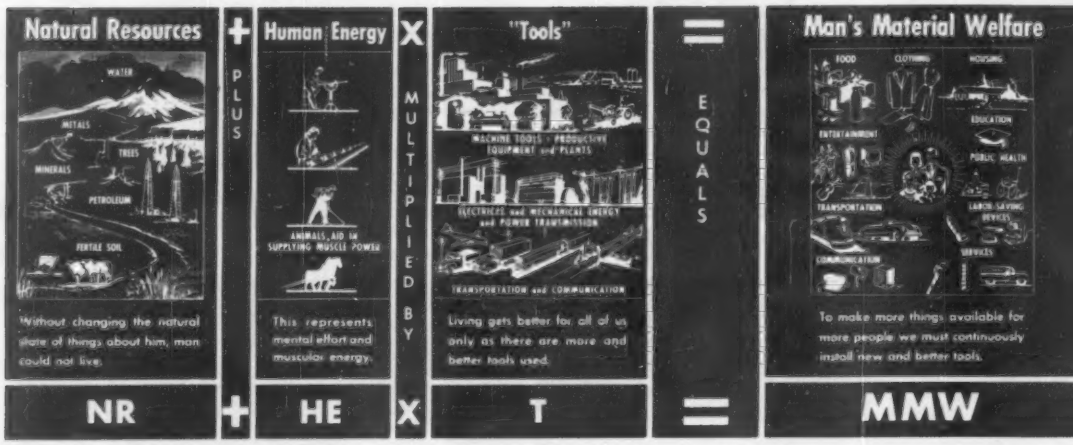
His hands enabled man to use primitive tools and to make more refined and specialized ones, freed him from the arduous and continuous hunting for survival. They made him versatile, suggested speech and language so he could communicate with his fellows on an increasing number of subjects. And that, in turn, developed man's mind and brain (the modern human brain is three times the size of the first ape man's) so he could produce the special-purpose tools that accelerated his departure from primitive life.

Soon man became so competent that he could provide himself with self-made bodily equipment – clothes, shelter, fire – and make himself the most adaptable of all creatures. Thus he could enter every climatic zone, and once there, dominate the realm. And his adaptability makes it possible for him to cope with any natural environment and any change almost immediately, while other animals can do it only in millions of years – if they survive.

But back of man's superiority and his present ability to live in comfort and security is his development of tools. First there were hand tools, then machine tools, and now the countless other "tools" of modern life that machine tools make possible.

These concepts are portrayed in their entirety for the first time in a series of ten exhibit panels currently being shown to groups all over the country by the Wilkie Foundation. Panels include actual tools, from primitive to modern, over a time span of a million years. Exhibits were secured from some nine museums and colleges here and abroad. Data from the panels are in turn combined in a single large chart reproduced inside this insert. Associated data, including one of the original panels, are also given here. Because we felt that you, as a tool producer and tool user, would want to know how tools began, we secured special permission from Leighton A Wilkie, founder of the Foundation, to bring you this summary as a sort of Christmas present of basic importance.

E J TANGERMAN
executive editor



ONLY TOOLS CAN IMPROVE OUR WAY OF LIFE . . . Man's material welfare is a combination of three things only, natural resources, human energy (mental and physical) and tools. Natural resources cannot be increased, human energy only slightly — so only by using more and better tools can we multiply our output, thus producing more goods for more people — and at lower costs.

TOMORROW WILL BE STILL BETTER

. . . If we improve our tools

LIFE began on our earth two billion years ago, but not until 500 million years ago did the fishes begin. It was 310 million years after that that the reptiles emerged, another 120 million years until the first mammal, and 69 million more years until the age of man. Thus man has existed only a two-thousandth as long as life on our planet, only a seventieth as long as mammals in general. Yet man has made himself supreme among all life on earth. Why?

Or consider man himself. We think of man as starting with recorded history 5000 years ago – because only in that relatively short period do we have records. Thus, more than 99% of man's evolution occurred before he learned to record it. Why, again?

Or consider our American way of life. A hundred years ago, man worked 70 hours a week and more, to produce goods and services worth only 27 cents an hour. Today, he works 40 hours a week, produces goods and services worth $1.21 per hour. We are producing almost five times as much with two-thirds the effort – and we own homes, cars, television; we have no famines; we have plenty of time to play. And yet again, why?

The answer to all three questions is tools. Man is the only tool-using animal. Americans use more and better tools than any other nation the world has ever known. Thus, for the first time in history, the great mass of our people lives well. Our tools have freed us from slavery to survival.

Thousands of years went by as man made his first halting steps with tools – from rough stones to the combination of stick and stone that made the spear, the idea of storing energy in a bow as he stored wild grain as food in a cave. But then man's ingenuity sharpened, and animals were domesticated, foods were grown, cloth was woven, houses built – and man began communal life. Here were the first steps toward responsibility to others, toward specialization, toward justice and property rights. And this was only a mere 60 centuries ago. But the pace was accelerating.

The wheel, calendar, mathematics, surveying, sculpture, potter's wheel, animals as beasts of burden, balance, regulated irrigation, keystone arch, sailing vessels, glass bottles – these all became possible with the shift from stone to bronze tools, then to iron. But muscles were the only power, so still the masses were enslaved, and real living was only for the chosen few. So three civilizations fell in turn – Egyptian, Greek, Roman – and for 500 years the new inventions lay dormant.

Not until the Renaissance in the 15th century did progress begin again. Craftsmen learned to use their tools with great skill, thus were honored and free. Science moved forward, for again there was incentive for development. Then came the Industrial Revolution, and the acceleration of man's development surpassed imagination. Here, at last, was power, and machines to take over the drudgery, books to convey information previously learned only by word of mouth, further incentive.

These concepts are expressed far more graphically in charts, here and within the fold. They will repay your study. For they show that you are working in the industry from which all others stem, that machine tools, in addition to being "the master tools of industry," are also the foundation stones of man's material progress. We are what we are because of tools, in continuously increasing number and variety, in more and more productive types. Only as we develop more and better tools do we improve our own lot.

HOW TOOLS HELP AMERICANS LIVE BETTER

...a timetable of progress

The extent to which *tools* have increased our standard of living is indicated below. Greater output per manhour means lower cost per article as well as higher wages. *Tools* are the key to providing the *greatest good for the greatest number*. The US is the richest nation on earth simply because of its abundance of *tools* to convert and convey natural resources. Only by more and better *tools*, used efficiently, can we multiply our output of goods and services per manhour.

YEAR	ENERGY SUPPLIED BY— MEN	ANIMALS	MECHANICAL POWER	TOTAL TOOL INVESTMENT	TOTAL NUMBER OF EMPLOYEES	AVERAGE WEEKLY HOURS OF EMPLOYMENT	OUTPUT PER MAN HOUR
1850	23%	51%	26%		10,000 000	70	GOODS AND SERVICES 27c WORTH PER HOUR
1880	21%	46%	33%	1 BILLION DOLLARS	17,333 000	66	GOODS AND SERVICES 39c WORTH PER HOUR
1900	15%	33%	52%	7 BILLION DOLLARS	29,000 000	60	GOODS AND SERVICES 56c WORTH PER HOUR
1910	12%	21%	67%	12⅓ BILLION DOLLARS	37,333 000	58	GOODS AND SERVICES 62c WORTH PER HOUR
1920	8%	11%	81%	15½ BILLION DOLLARS	41,333 000	54	GOODS AND SERVICES 70c WORTH PER HOUR
1930	6%	4%	90%	18⅓ BILLION DOLLARS	45,500 000	47	GOODS AND SERVICES 82c WORTH PER HOUR
1940	4%	3%	93%	20⅔ BILLION DOLLARS	47,500 000	43	GOODS AND SERVICES 97c WORTH PER HOUR
1950	4%	2%	94%	33 BILLION DOLLARS	58,500 000	40	GOODS AND SERVICES $1.21 WORTH PER HOUR
				AS THIS INVESTMENT INCREASES →	THIS GOES UP →	THIS GOES DOWN →	AND THIS GOES UP

Sources: Dept Commerce, Dept Labor, Bureau of Census, 20th Century Fund, Federal Power Commission, American Economic Fndtn, banking and other sources

HOW BASIC TOOLS CREATED CIV

The term—"TOOLS"—includes all of the things used by mankind to improve human welfare . . . TOOLS, therefore, are the facilities that produce, transport or exchange, goods and services.

These TOOLS are made possible by a specific class of machines known as *machine tools*, which are basic, power-driven tools that perform fundamental functions such as—cutting, drilling, scraping, sawing and abrading.

Machine tools perform in complicated ways, the same basic functions and operations as hand tools. These basic functions were established by hand-held stone tools shaped by primitive man.

It was through devising and using hand-held stone
mankind developed powers of mental and bodily c
. . . and this, in turn, accelerated the increase in ma
capabilities.

While modern civilization is dependent upon vast
and exchange facilities for food, clothing, shelter an
—the underlying foundation which makes all of this
power-driven machine tools.

MATERIAL AND CULTURAL PROGRESS OF
OVER 500,000 YEARS AGO USING TOOLS for HUNTING WILD GAME and FOOD GATHERING
OVER 250,000 YEARS AGO-MAKING FIRE
OVER 400,000 YEARS AGO TOOL MAKING
OVER 15,000 YEARS AGO-BOW and ARROW
OVER 13,000 YEARS AGO-SPEAR THROWER
OVER 10,000 YEARS AGO-BEAD PENDANTS, CLAY FIGURES
OVER 12,000 YEARS AGO-CAREFULLY DONE ANIMAL DRAWINGS
ABOUT 8,000 YEARS AGO ANIMALS DOMESTICATED
ABOUT 6,000 YEARS AGO SICKLE for HARVESTING
5,000 B.C.—LOOM or WOODEN LOOM
STONE AND WOOD HAND TOOLS
Energy supplied only by human muscle power
Beginning over one million yrs ago
EOLITHS (Dawn stones)
Beginning over 500,000 years ago
ALL-PURPOSE FIST AXE
Beginning over 50,000 years ago
SPECIAL-PURPOSE TOOLS
Extensions of the hand
Cutting
TWO PLANES CONVERGING TO FORM A CUTTING EDGE

CIVILIZATION

held stone tools that
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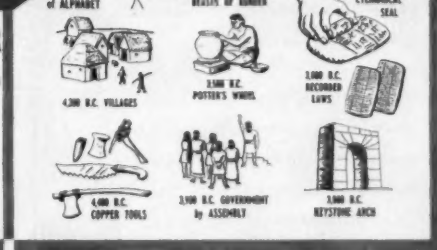
all of this possible is

OF WESTERN CIVILIZATION


SIGNS—BASIS of ALPHABET
3,500 B.C. WHEELED VEHICLES, BEARS OF RUNNER
4,300 B.C. VILLAGES
3,500 B.C. POTTER'S WHEEL
3,000 B.C. RECORDED LAWS
4,400 B.C. COPPER TOOLS
3,900 B.C. GOVERNMENT by ASSEMBLY
3,060 B.C. KEYSTONE ARCH

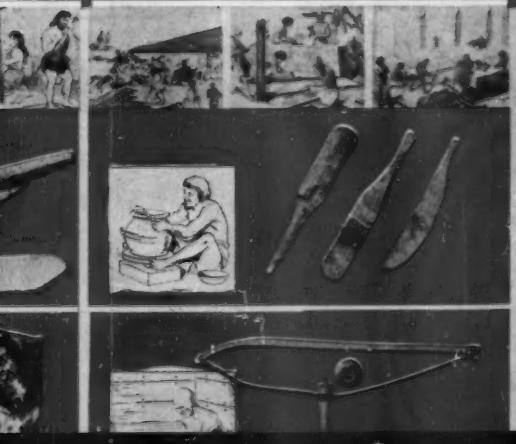
LAWS OF PHYSICAL SCIENCES
PYTHAGORAS 47th CENT. B.C.
ARCHIMEDES 287 B.C.
EUCLID—300 B.C.
1,400 B.C.—IRON FROM ORE
1,300 B.C. GLASSWARE
1,300 B.C. TRADE SPREADS CIVILIZATION
1,400 B.C. WATER LEVEL
1749—ARKWRIGHT SPINNING MACHINE
1450 A.D. GUTENBERG PRESS
100 A.D. COMPOUND PULLEY
1ST CENT. A.D. PULLEYS and COGS as GEARING
440 B.C. FUNDAMENTALS of ARCHITECTURE
820 B.C. STONE ROADS

METAL HAND TOOLS

Energy supplied by men and animals

Beginning over 6,500 years ago

BRONZE AGE



Beginning about 3,400 yrs ago

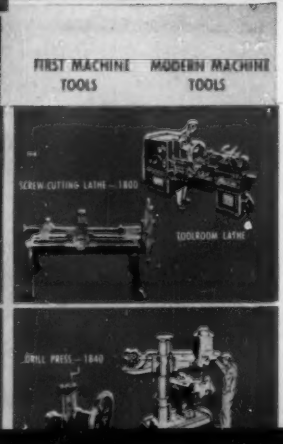
IRON AGE

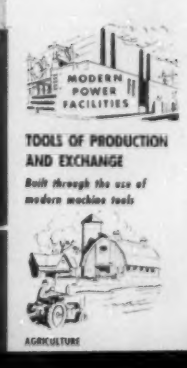
MACHINE TOOLS

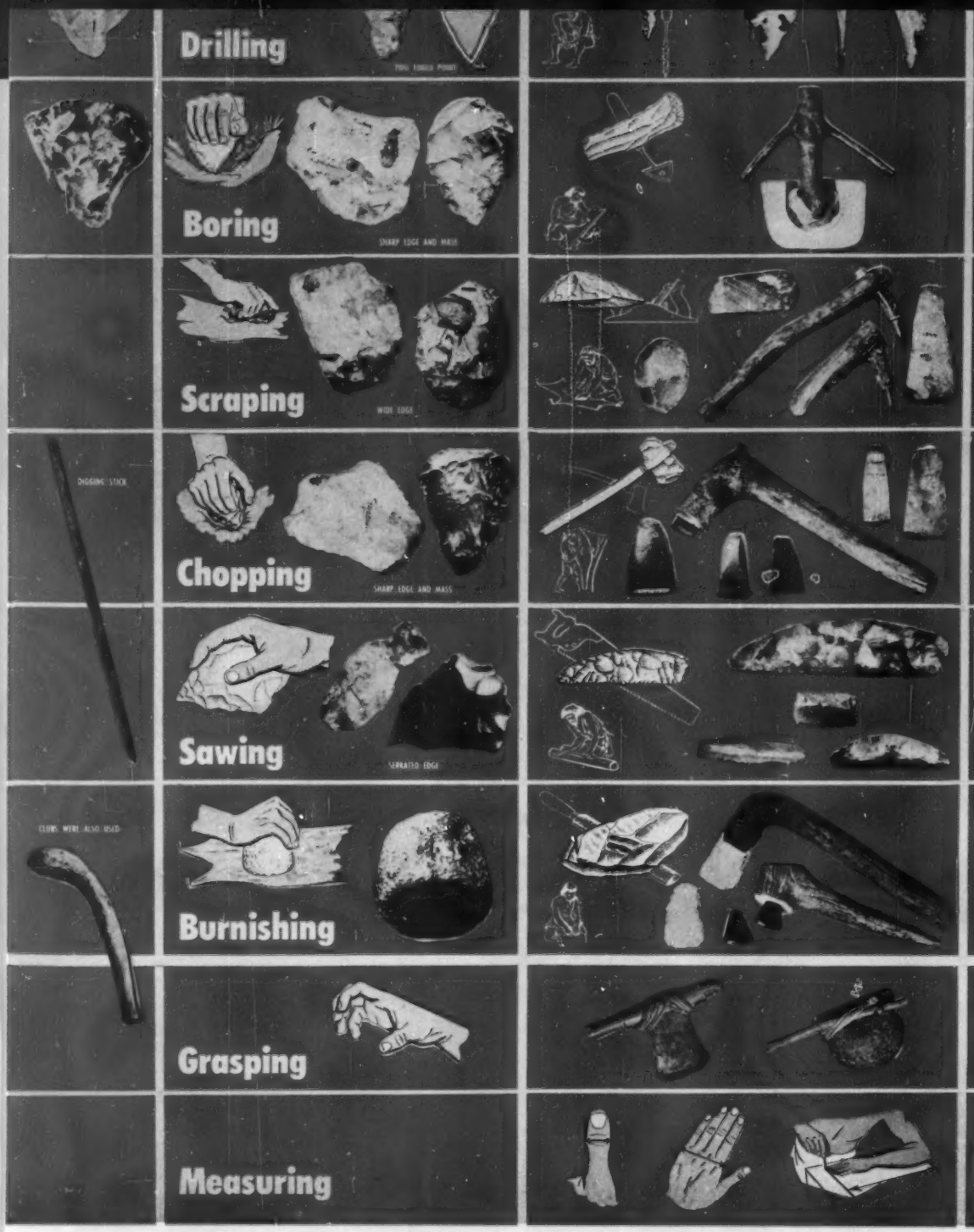
Energy by mechanical and electrical power

Beginning about 150 years ago

INDUSTRIAL REVOLUTION







HOW TO STUDY THIS CHART

1.. Read the type at upper left.

2.. Note particularly the graph line showing the rise of Western civilization – the slow rise until the beginning of the Bronze Age, the much faster rate of improvement beginning 6500 years ago, and tremendous development of the past 150 years.

3.. Major steps in development, age by age, are illustrated directly below the graph line, in order from bottom to top, and left to right.

4.. Vertical columns in the body of the chart establish six periods of man's progress, and segregate significant events under specific headings.

First column . . Eoliths (dawn stones) provided the first cutting edge. The sharp cutting edge is all-important, for with it, everything else is made – tree branches are cut, digging sticks sharpened, meat and hides cut. This period was 1 million to 1/2 million years ago.

Second column . . Fist axes, the first man-made cutting tools, were really heart-shaped stones with sharpened edges. Man shaped these flint axes by chipping instead of hunting for sharp-edged stones. He had a better tool, could do a greater variety of work, hence improved his scale of living greatly. This development occurred about half a million years ago.

Third column . . Special-purpose stone tools, and better form so cutting action could be controlled, made possible complex implements for hunting, fishing, and later, tools

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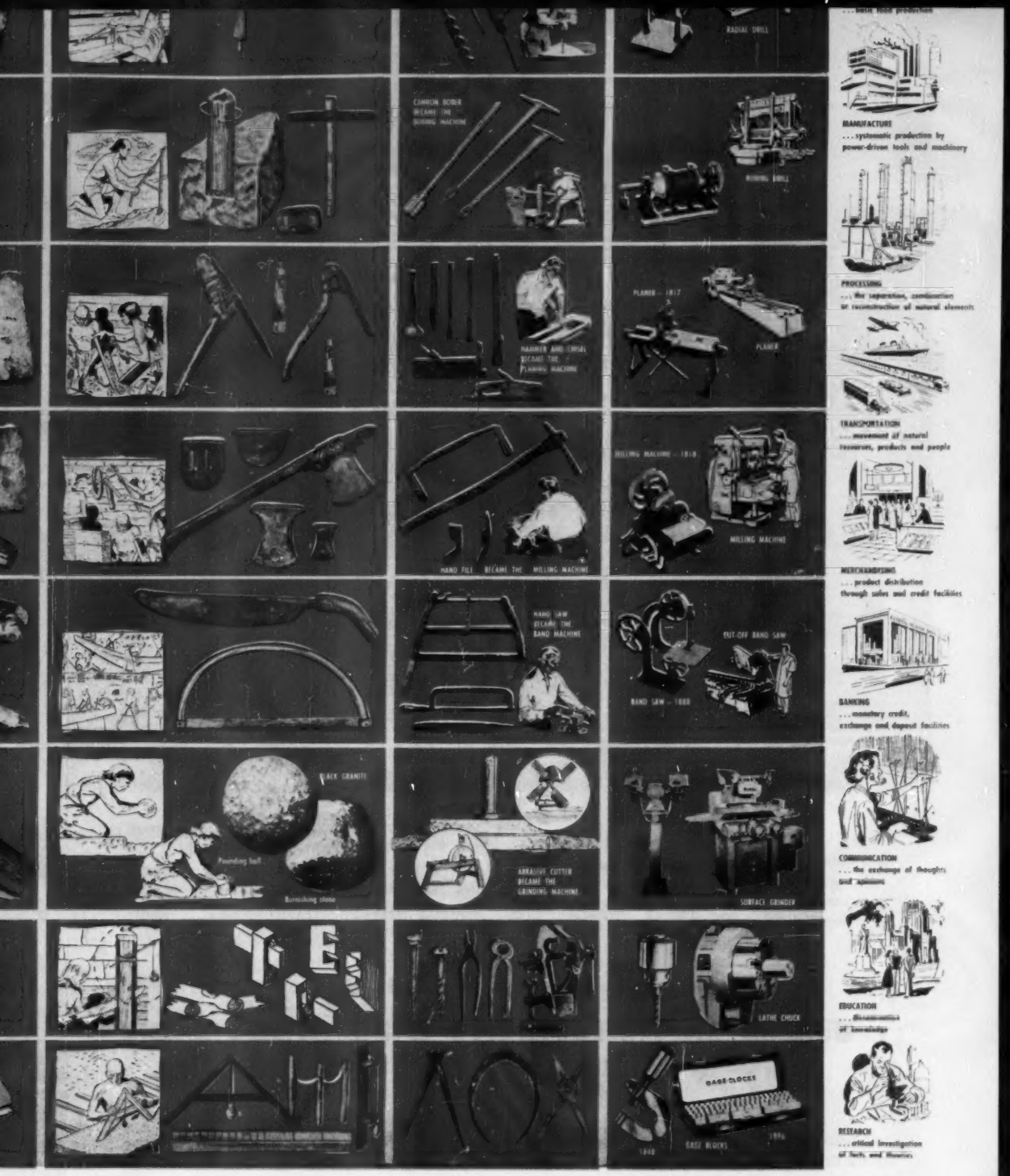


for agriculture. Beads, other ornaments, figurines, and production tools like looms were also made possible by this development about 50,000 years ago.

Fourth column . . The Bronze Age, only 3500 years ago, brought more durable, more efficient, easier sharpened cutting edges of metal. Here also occurred the beginnings of standardized linear measurement, and instruments for accurate building.

Fifth column . . The Iron Age, beginning about 2500 years ago, replaced bronze with more plentiful and durable iron. Cutting edges were improved—such as the set tooth on the saw. Also, cutting was controlled by physical means, as in the plane and shears.

Sixth column . . The Industrial Revolution, only 150 years ago, greatly accelerated human progress. But it was made possible only by a million years of plodding human effort in tool making, spreading human knowledge, release from servitude, rightful reward for effort, better materials, and, above all, freedom of action as a sound foundation.

5 . . Horizontal columns in the body of the chart separate types of tools. Thus any type of cutting tool may be studied, from primitive to modern, by going across horizontally.

6 . . "Fruits" of the machine age, and some typical modern "tools" are in the far right-hand column. Modern machine tools make these possible.

CHART COURTESY OF THE WILKIE FOUNDATION.

REPRODUCTION PROHIBITED WITHOUT SPECIFIC PERMISSION

"TOOLS" MAKE AMERICA GREAT

THE U.S. TREE OF ABUNDANT PRODUCTION

The symbolic picture of the tree and its roots summarizes the meaning of the term "Tools". "Tools" include all the things used by man to improve his material welfare, ... exchange goods and services. Every one of these developments had but one purpose—to change the form, condition or place of natural resources with less expenditure of time and human energy.

By 1800 several series of developments converged to form the *Roots* of our industrial might.

Machine tools form the *Trunk*, for these basic power tools are required to begin the making of Everything — from steel mills to printing presses, from farm tractors to skyscrapers, from tiny screws to great turbines.

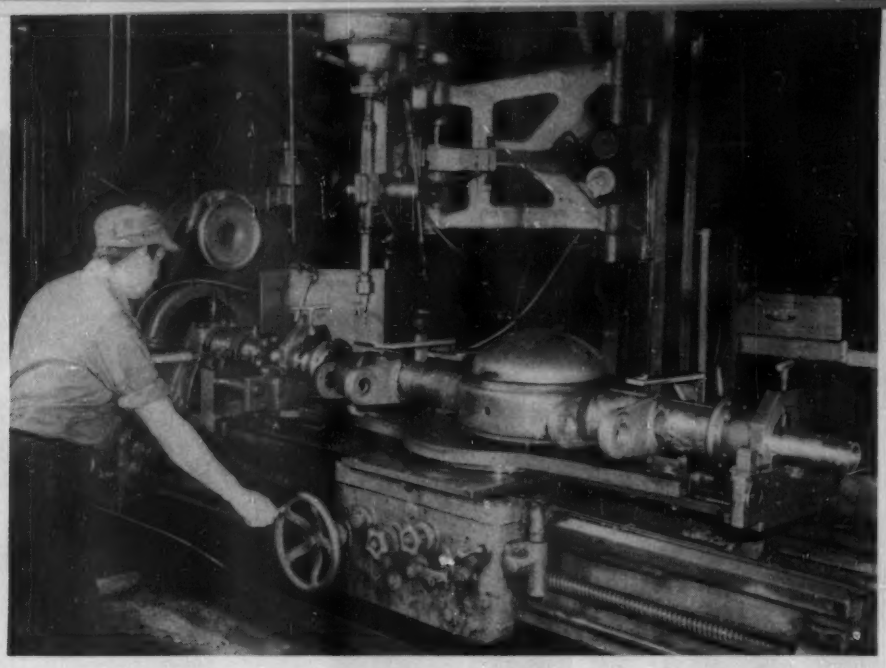
The *Branches* are all of the implements and facilities for power, for production, for transportation, merchandising and banking which together make America great.

The *Fruit*, as pictured below, is our food, clothing, housing, education, entertainment and material comforts plus our leisure, spiritual and cultural opportunities.

The Harvest from "Tools"

Only as our "Tree" grows larger and more efficient can we have more "fruit" — goods, comforts and leisure for more of our people.

Copies of this insert may be obtained from Reader Service, American Machinist, 330 West 42nd St, New York 36, N Y, for 25 cents each, with a reduction for quantities over 100.

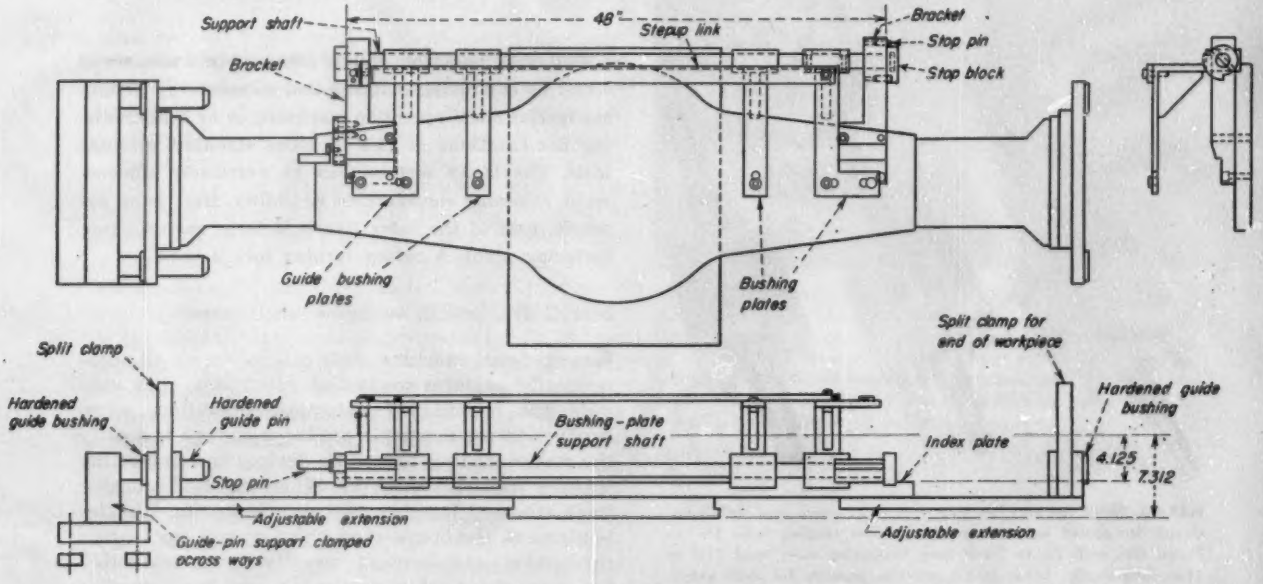


Differential housing rests in interchangeable V-blocks and supports, under clamps, on plate fixture attached to old lathe in place of cross-slide. Housing is swung end-for-end by backing off carriage, rotating fixture by hand, then bringing carriage back up so guide bushings (right end) pass over pins under lathe head. Self-opening diehead cuts threads on housing ends. Hammond sensitive radial drill back of lathe cuts oil-line holes

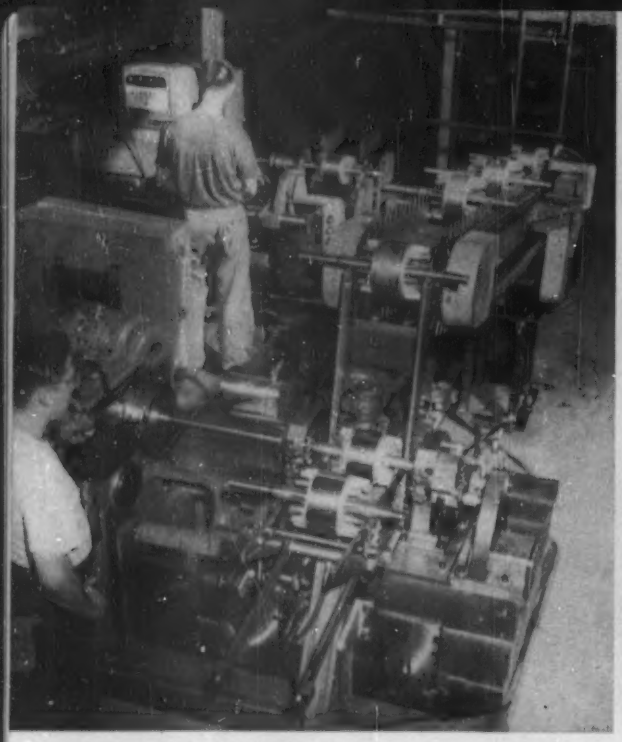
Conversion capers speed threading and drilling

A G GOULD, master mechanic, Automotive Div, CLARK EQUIPMENT CO, BUCHANAN, MICH

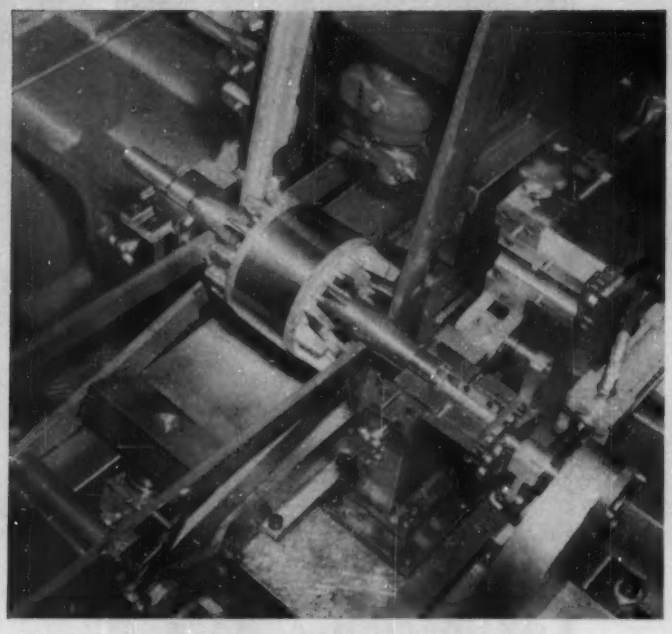
Variety is characteristic of Clark's differential-housing production, and among the outstanding general machine-tool conversions in the plant is a 20-in. lathe fitted for threading and drilling on many sizes of housings. Where high production is required on some housings, specialized machine tools run at high speed; but for the short orders, adjustability is the feature



Fixture turns on large ball bearing under main plate. End plates under housing can be interchanged for other housing models and sizes. Long shaft behind fixture supports leaf jig-bushing plates and spacer links for the hole-drilling operation, done at the same setup

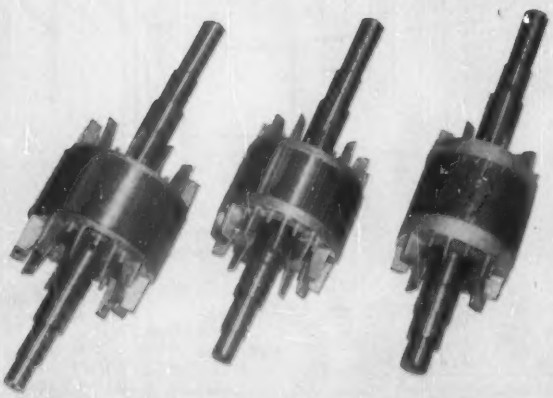


MOTOR-DRIVEN CHAIN CONVEYOR interconnects semiautomatic loading-unloading devices on adjacent automatic lathe and dynamic balancer to provide synchronous transfer of finish-turned rotors to balancer. Conveyor is controlled by limit switches actuated by monorail-supported rotor transfer carriage used to load balancer



OPERATOR STARTS CYCLE by manually selecting a rotor core and a shaft from adjacent conveyors and assembling them in an arbor press. He places assembled rotor on rails of loader, behind stops. When lathe is cleared of previous rotor, operator releases stops to permit rotor to roll into steadyrest bearings, as shown. Then air cylinders close bearing caps and advance floating driver

Synchromation speeds output of

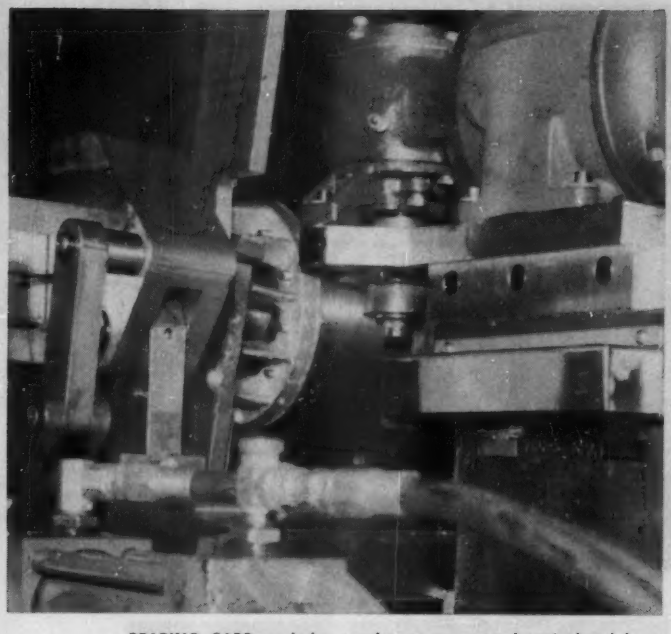


FLEXIBLE SETUP permits working rotors for open and totally-enclosed, fan-cooled induction motors in sizes ranging from 6⅛- to 7½-in. OD, with 2¾ to 3½-in.-long lamination cores, and 21⅛ to 51-in.-long shafts. Latter length provides capacity for shaft extensions up to 12 in. over standard on pulley end of shaft. Rotor OD is held within 0.002 in. tolerance. (Rotor at right is unfinished)

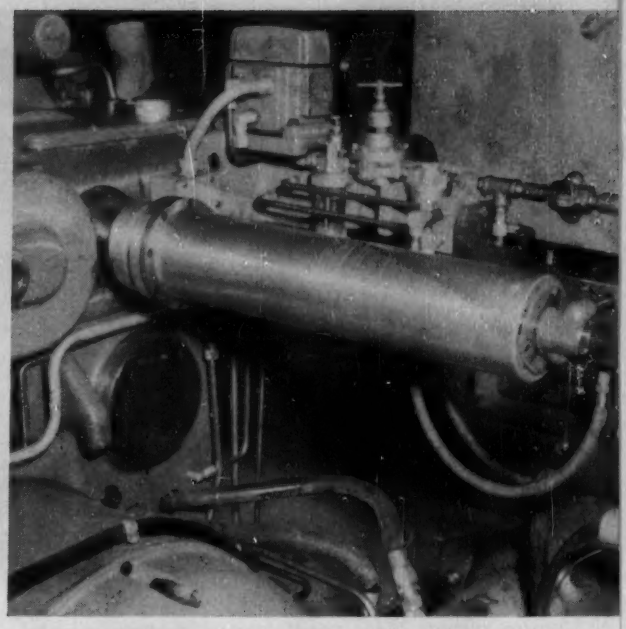
Automatic operation can be achieved in a number of ways: by combining machine-tool elements, by designing special multi-operation machines, or by synchronizing the functions of two or more standard machine tools. The latter method can be extremely efficient, while retaining considerable flexibility. Here is an example, part of the rotor line in a large motor-manufacturing plant. A rotary turning tool is used

BEN C BROSHEER, associate editor, (Chicago)

Conventional machine tools can be set up to automatically perform sequential operations, thus provide the benefits of automatic operation, when production requirements are large enough to justify the cost of loading-unloading devices and connecting transfer units or conveyors. When standard machine tools are used together with synchronizing transfer equipment, the break-even point on tool cost versus production requirement usually is considerably lower on the total-quantity-required scale than it would be for machine especially designed and built



BEARING CAPS on lathe steadyrest are opened and closed by a clevis-mounted, double-acting air cylinder controlled by pushbuttons and solenoid valves. When caps are in place and locked, operator turns rotor by hand to align keyway in shaft with key in driver, then operates pushbuttons to start lathe spindle and automatic turning cycle. Disk cutter (center) rotates at 36 rpm while turning rotor. Cutting speed is 1200 sfpm, depth of cut is 0.030 in., and feed is 0.015 ipr. Stock is laminated silicon steel



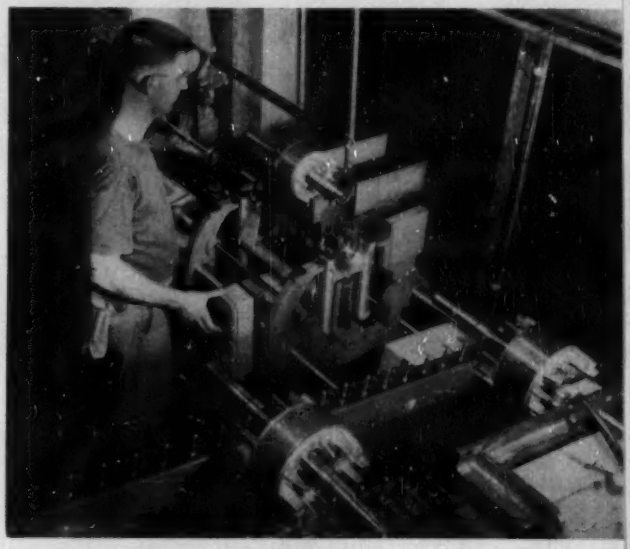
FLOATING WORK DRIVER is actuated through bore of lathe spindle by double-acting air cylinder (shown) mounted on bracket at end of lathe headstock. Solenoid valve controls piston movement

standard machines

for multi-operation machining. However, greater over-all machine-tool utilization is the key factor in determining whether this system is most beneficial of those available for automatic manufacturing.

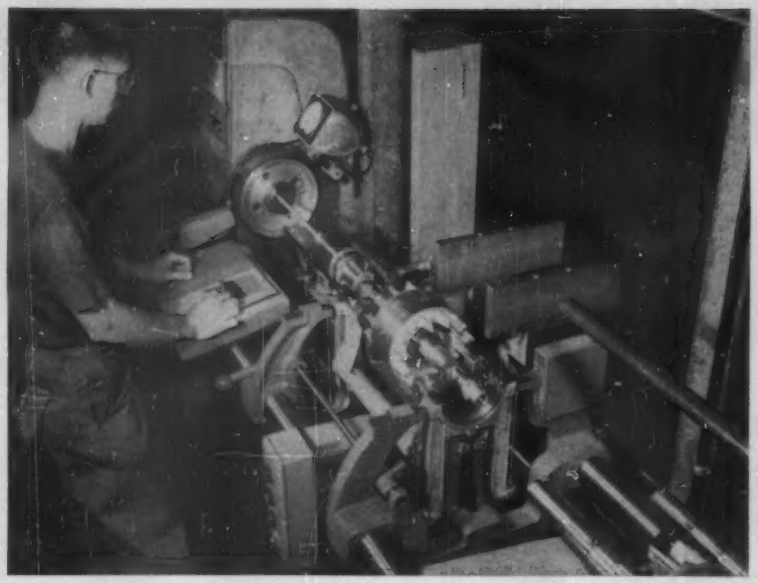
Synchromation, we feel, is a word of encouragement for the tool planner and methods man whose bread and butter is in a shop full of conventional machine tools; for the fellow who feels in these days of automation, like a farm horse on a fast track. While automatic operation started, logically, at very high, specialized production levels, the principle can be applied at much lower requirement levels. Before *you* say, "That's not for me!" try to correlate the principles to your problems and equipment.

High-output machines recently installed in a number of metalworking plants have proved the feasibility of using automatic and semi-automatic loading-unloading devices on individual, specially tooled automatic lathes and other machine tools. To synchromate a line of such machines, it is necessary only to tie the work loaders-unloaders together with automatic or semiautomatic conveyors or other transfer devices and coordinate the output of the



MONORAIL-SUPPORTED CARRIER trips limit switches which control conveyor delivering finish-turned rotors from lathe. Moving empty carrier into "pickup" position causes conveyor to deposit next rotor on carrier hooks. Then carrier delivers rotor above and slightly to rear of balancer cradle bearings. Air-operated loader raises to lift rotor from carrier and lower it into cradle bearings. Operator then manually returns carrier to pickup position

PLEASE TURN PAGE ... ▶



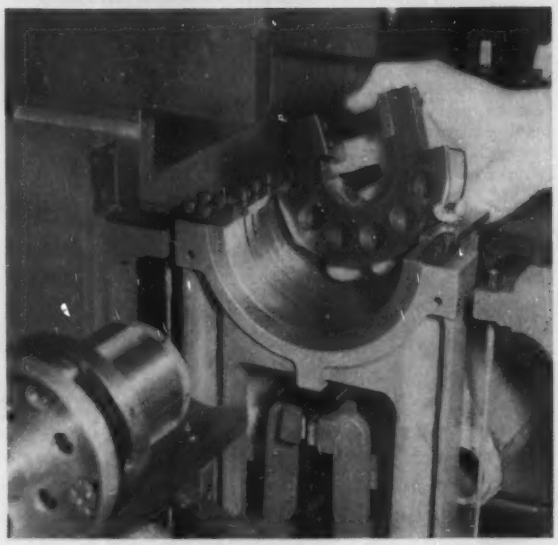
BALANCING OPERATION consists of observing angle and amount of unbalance at both ends of rotor, then placing correction washers on pins diecast on rotor ends. This, an inspection run, and riveting-over the heads of the washer retaining pins requires an average floor-to-floor time of 106 sec. After achieving desired balance, operator uncouples drive and actuates elevator to raise rotor to unloading rails at rear of machine, from whence rotor rolls onto belt conveyor (not shown)

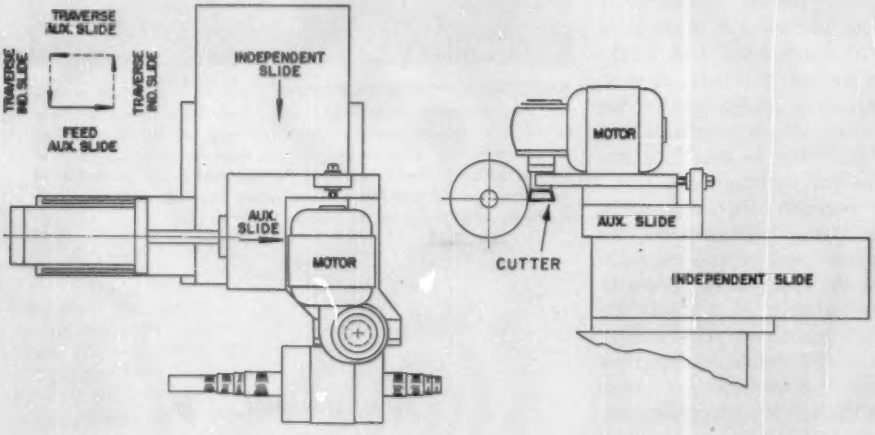
FLEXIBILITY OF SETUP is facilitated by grooves in balancer cradle so bearings can quickly be moved into correct positions to accommodate any of the 16 different rotor sizes handled

entire system. Machines arranged in such lines to provide sequential operations need not be of the same type and can be used for widely varying operations. Frequently, work-handling devices can be designed to handle a range of work sizes, with minimum changeover between setups.

Conveyors and transfer equipment for synchromation, however, become a part of the manufacturing cycle, hence must provide *positive* feeding of parts between machines. This arrangement differs from the conventional conveyor-fed line which depends on operators to load and unload machines.

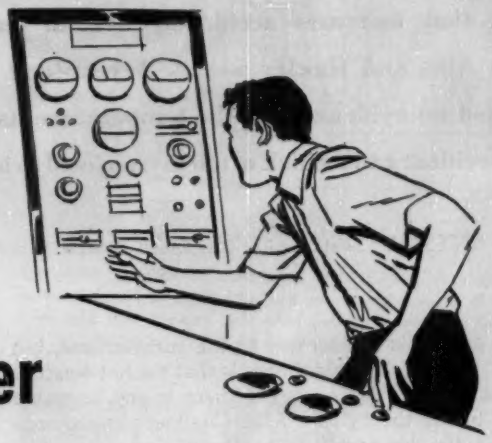
For example, the conveyor-connected line shown recently was installed by a well-known electric motor manufacturer. It combines a specially tooled Gisholt No. 12 hydraulic automatic lathe and a No. 3S Dynetric balancing machine to precision-turn the OD of motor rotors, then dynamically balance them. The line can handle 16 sizes of rotors and can deliver a complete rotor to a passing, general-purpose belt conveyor every 106 sec.





ROTARY TURNING TOOL has broad application; is mounted on vertical shaft of ¼-hp, geared-head motor, in turn mounted on auxiliary slide which is carried on an independent cross-slide on the automatic lathe. Rotated at 36 rpm, cutter is 2 in. OD, ¾ in. thick, Kennametal K-8 cemented carbide. It is tapered to give 6° clearance behind the cutting edge and dished to give approximately 10° rake. Cutter has 15 times the tool life of a single-point tool. In rotor-turning setup, unloading operation is completely automatic, triggered by independent slide at end of cut

Round Table



The switch snapper

"How's the fancy new machine working out, Al? I heard you couldn't even get as much production out of it as a turret lathe."

"That was last week, Ed, before we finally got a good operator. Now it turns out almost twice as much as a turret lathe."

"You sure must have gotten a hot mechanic, Al. Last I saw of it Friday, there wasn't a man in the shop that could get more than 30% speed on it."

"We were using lathe hands, Ed, and that was the trouble. We got this man from the shipping room, and he doesn't know a thing about lathes. In fact, he can't even read blueprints yet."

"Well, now, that's the tallest tale I've heard this year, Al. You don't expect me to believe that a common laborer can work a goldberg contraption like that, do you?"

"Why not, Ed? We broke him in on all the controls, then let him work up to speed. All he does is load, operate the levers and switches, and unload. The setup man sets the stops and limits."

"Listen, Al; I don't think even the setup man can work that machine at top speed. It's too complicated. I saw the factory representative run it, but he's had a lot of training and practice."

"That was the trouble, Ed. We started off trying to get lathe hands to run it, and all the time we needed just a fast-moving operator. I guess a lathe hand knows too much about the machine, and tries to see exactly what's going on. This new man doesn't worry about what's happening; he just keeps moving."

"But it just doesn't stand to reason that a green man could run that machine, Al. You can't replace the operator that easily, and don't try to tell me that it's the machine that counts, not the operator."

"I won't Ed, but in this case we need a different kind of operator than we ever had on the older lathes. He's not a machinist, but he's smart enough to follow instructions exactly and he's handy enough not to get himself tied in knots when he's working fast."

"That's not my idea of a trained machinist, Al. I hope you're not going to convert the whole plant to these machines."

"We won't, Ed. They're special-purpose high-speed units, and we'll still need engine lathes and skilled toolmakers."

***IS THERE** a new kind of machine operator coming up? Can Ed still claim that it's the man who's important, not the machine? Your opinion on this subject may be helpful to others. Discussions of earlier topics appear on later pages.*

It's not the weather...

. . . that increases accidents; not, at least, at Allis-Chalmers West Allis and Hawley works. A year-long study of heat vs cold showed no evidence that the temperature had anything to do with the accident rate, which often mysteriously rises in the summertime.

ANN STRESAU, Safety Services Dept, ALLIS-CHALMERS MFG CO, MILWAUKEE

Shop accidents *do* increase in the summertime, but why? A generally held theory is that the hot weather affects people. To find out if there is any provable truth to the theory, the Allis-Chalmers study considered the temperature, barometric pressure, humidity, and whether days were sunny, cloudy, or rainy. These factors were compared with the number of injuries requiring a doctor's attention which occurred on each day.

Analysis of the results indicated these conclusions:

(1) Accidents are *not* more frequent on hot summer days than on cool summer days.
(2) It is unlikely that sunshine or overcast have anything to do with accident frequency.
(3) There does not seem to be any difference in number of accidents on rainy compared to non-rainy days.
(4) Barometric pressure and humidity have little, if anything, to do with the frequency of accidents.
(5) In the summer months there is an increase in the proportion of doctor's cases involving hand tools, eye injury, and harmful exposure (cases resulting in dermatitis, burns, etc). These did not correlate with the hot days either.

WHAT TEMPERATURE DOES

It doesn't do very much, evidently. To find this out, the relationship between temperature and accidents was studied in three ways. First, the temperature and frequency rates were graphed for the year 1953 and the trend was found to be quite similar. But the year 1952 did not show a similar pattern when treated in the same way.

Second, a detailed study of the three hot months in 1953 — July, August, and September — showed that on days when the temperature went over 80F, the average was 5.37 accident cases per day. On days when the temperature stayed under 80F, there were 5.74 cases per day. This is not enough difference to mean anything.*

Taking a third tack, by dividing all working days for the three months into four groups; temperature much above normal, slightly above, slightly below, and much below normal; the average number of cases per days works out to 5.3, 5.8, 5.6, and 4.2. Again, no significant difference.

SUNSHINE

The amount of sunshine per day, in percentage, was compared to the number of cases:

% Sunshine	Days	Cases	Avg Cases/Day
80-100	35	191	5.5
50- 79	23	128	5.6
0- 49	7	40	5.7

The difference between sunny and cloudy days is nil.

There were 24 rainy days and 41 non-rainy days during the three months (considering working days only). On rainy days, there were 137 cases, or 5.7 cases per day on the average, and on non-rainy days 222 cases, or 5.4 per day. This, too, is so slight a difference it must be doubted to have any value.

BAROMETRIC PRESSURE AND HUMIDITY

Both of these factors are often said to affect how a person feels, but when the pressure and humidity were charted for the three hot months, no difference of any importance could be seen:

Pressure	Days	Cases	Avg Cases/Day
Rising	11	69	6.3
Changing	24	126	5.3
Falling	30	164	5.5

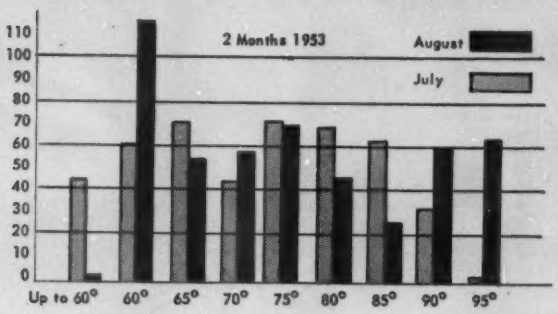
And when the exact pressure each day was charted against the cases, the average for low-pressure days was 5.5 cases, and for high-pressure days, 5.8 per day. Again, no difference of importance.

Percent relative humidity worked out about the same, on the average, with no significant indication that humidity means anything in relation to accidents.

% RH	Days	Cases	Avg Cases/Day
Under 50	37	215	5.8
Over 50	28	144	5.1

** In these studies, the data was put to test statistically. When it is stated that there is no difference, statistics have shown that the slightest difference you may observe is not significant or reliable.*

Rate of Doctor's Cases at each Temperature



NO CONSISTENT TREND SHOWED UP when doctor's cases were plotted against temperature during two summer months. On the bar chart, the number of cases per million man-hr worked were charted above 9 temperature ranges. Total of 252 cases was used

Perhaps the weather has something to do with what kind of accidents become more common. To see about this, the four winter months were called "cold," the four summer months called "hot," and the remainder called "temperate."

Classification 1952 and 1953	Number of Accidents in Cold Months	Temperate Months	Hot Months	% of Accidents in Hot Months
Materials handling (manual)	200	186	221	36.5%
Materials handling (vehicle)	15	14	14	32.5
Materials handling (crane)	44	41	45	34.6
Piling and Placement	33	72	48	31.4
Vehicle Operation	18	11	9	23.6
Machine Operation	103	88	66	25.2
Metal Fabrication	1	8	5	35.4
Foundry Operation	8	1	7	43.8
Assembly	5	14	15	44.0
Hand Tools	75	71	103	41.3*
Power Tools	18	29	21	31.0
Harmful Exposure	22	37	95	38.0*
Bumps and Falls	206	236	224	33.5
Eye Injuries	130	184	218	41.0*
Others	47	40	42	32.6
Total	925	1032	1133	36.5%

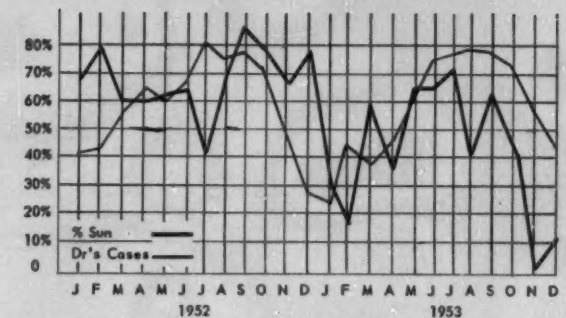
If the percentage during the hot months is over 33%, it can be inferred that hot weather may have had some effect. Although manual material handling is over 33% it did not prove to be high in both years and, therefore, must be discounted (in 1952, the percent was only 32, while in 1953 it was 42%). Cases classified under metal fabrication, assembly, and foundry were high in other seasons as well.

Therefore, the clasifications which stand out as being more troublesome during the summer months are hand tools, eye injuries, and harmful exposures. When the average number of these cases on days over 80F was compared with the average which occurred on cooler days, again, no significant difference was found.

NOT THE LAST WORD . . .

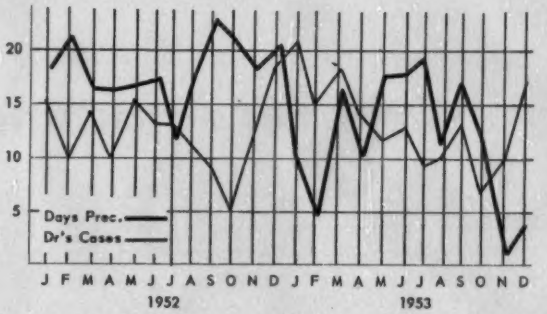
Allis-Chalmers people do not feel that this is the last word on the subject. Realizing that one study in one company is not all-conclusive evidence, they hope that other companies will add to the research on this subject. They, at least, are satisfied that weather is not so all-important and they are seeking other factors which might account for the increase of accidents in the summertime.

Percent of Possible Sunshine by Months



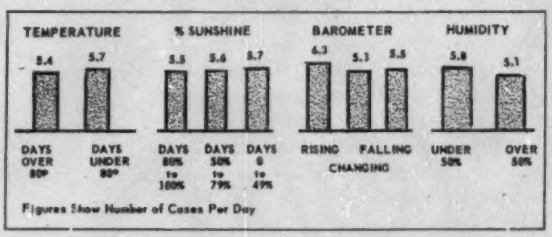
SUNSHINE *SEEMED* TO CORRELATE WITH CASES when the % of sunshiny days was charted for two years, and a curve of doctor's cases was superimposed. But when average number of cases per day was tabulated, it did not bear out this conclusion

Number of Rainy Days per Month vs. Doctor's Cases per Month



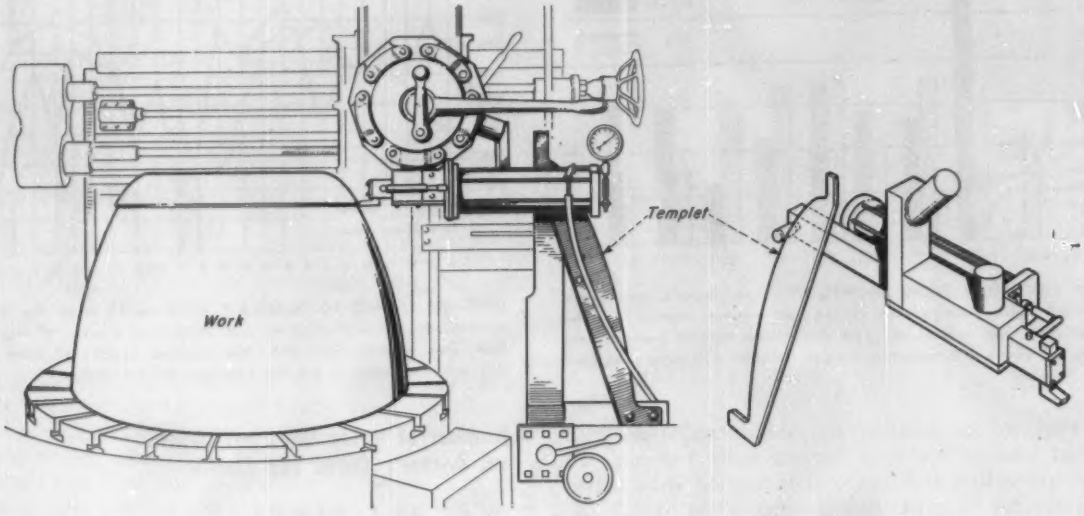
RAIN *SEEMED* INVERSELY PROPORTIONAL TO DOCTORS CASES when the number of rainy days per month was charted for two years, and a curve showing the proportional number of doctor's cases per month was added. But further study showed that the average number of cases on rainy days was not significantly lower

Accidents and Summer Weather



NO RELATIONSHIP WAS FOUND between accidents and temperature, sunshine, pressure, or humidity. Here the number of cases per day are charted for days when temperature was over 80 and under 80, and so on. The differences are too slight to be significant

Practical Ideas . . .



Air-Cylinder Attachment Aids VTL Contouring

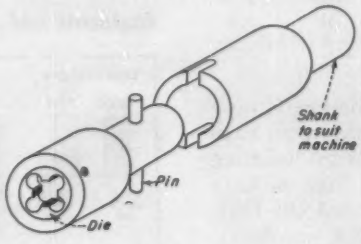
Contouring on a 54-in. Bullard VTL is done very quickly and easily with this simple, inexpensive air-cylinder contouring attachment.

The work is a 2300-lb casting, 40-in. diameter, 25 in. tall. The templet is mounted in the sidehead of the lathe. Although the sidehead is, of course, movable, it is moved only to position the templet, and is locked in place during turning. Special brackets at the top, middle and bottom of the templet give rigidity to the setup.

An auxiliary cross-slide and pneumatic piston are mounted in the vertical head of the machine. Air pressure on the piston is transmitted through the piston rod to an arm connected to the toolholder. This pressure forces the roller against the templet during contouring. The tool, holder, and roll-follower make up what amounts to a solid unit, so the tool follows the contour path.

Turning begins at the bottom of the piece. Feed is upward, by means of the vertical head. As the head rises, the follow roller, held against the templet by air pressure, moves the tool inward to correspond to the desired contour.

The pneumatic piston is 4 in. in diameter, with a 14½-in. stroke, and pressure within the cylinder is kept constant at 35 psi. Air comes from the shop line, so it must be metered through a tank on the floor behind the machine. This tank, besides reducing the pressure, provides a reservoir to insure a steady force against the templet. *Alfred De Angelis, Max Ams Machine Co, Bridgeport, Conn.*

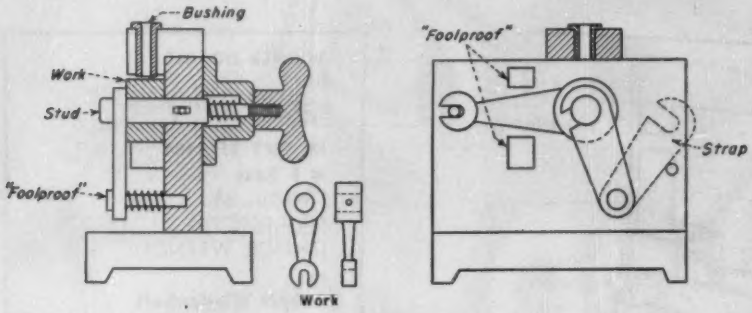


Adapter Releases Tubing Die

We had to thread some tubing of a size for which we had no chasers. Instead we used a button die. To provide automatic stopping of the thread, we made the adapter shown.

As the ram is fed to the work, the die catches and cuts in the regular way. When the stop is reached, the ram stops, the die continues to thread until the pin disengages the holder from the shank.

Just as the pin disengages, the edge of the pin has a sort of cam-action which kicks the ram back about ⅛ in. This permits us to stop the work, re-engage the pin, and reverse the work, backing off the die. *William Hartmann, Sheboygan, Wis*



Drill Jig Cuts Non-Productive Time When Loading Work

We designed this drill jig to reduce the non-productive time needed for loading and unloading work. The work is cast iron, with one large hole bored, the outer surfaces turned parallel, and the slot in the other hub milled. The hole to be drilled with this jig is transverse to the hole in the larger hub.

To get quicker loading time for this job, we decided to load the part from the rear of the fixture, rather than from the top or front, as is conventional.

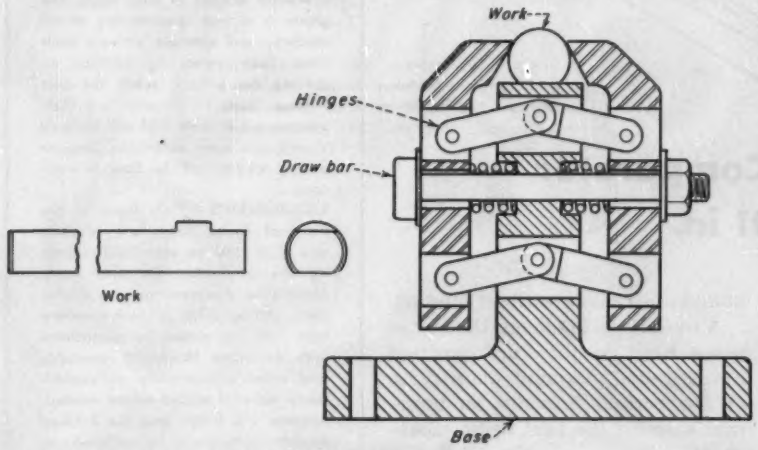
In operation, the slotted strap, which swings around on a pivot, rests against the stop pin. Work is loaded into the fixture, the bored hole is placed over the stud, and the milled slot is placed on the stop pin. The two rectangular bars, near the stop and on the main body, are a kind of foolproof, to avoid putting the work in the wrong way.

Then the slotted strap is swung into working position, engaging in a recess in the stud end. A small turn on the clamping knob fastens the work in place.

To remove the work, loosen the clamping knob. The spring in the housing forces the stud outward, freeing the stop. Chips produced during drilling fall out of the jig through a slot in the stud. *Federico Strasser, Santiago, Chile*

When using a lockscrew to jam up against the threads of a bolt, and you want to avoid damage to the threads of the bolt, fill the lockscrew hole with cotton wadding, and put a few drops of oil on the cotton. Turning the lockscrew against the cotton will hold the bolt without damage to its threads.

In some cases, a copper plug will be preferred to the cotton wad. *G R Milner, Lincolnshire, England*



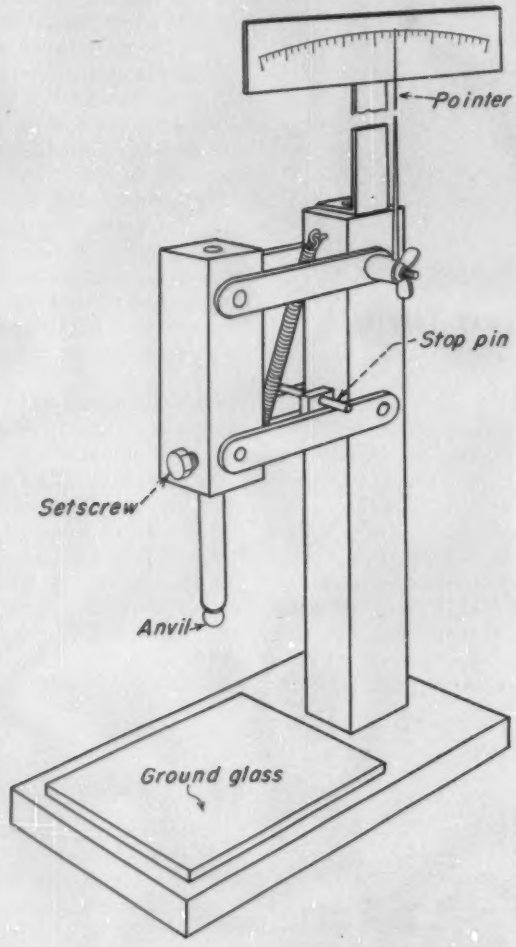
Self-Centralizing Clamp Aids Milling Flats

The fixture shown here helped us mill the flats on a large number of mill steel rods which were to be machined to close tolerances. The flats were to be parallel, to each other and the axis of the rod, and to tolerance of ± 0.0008 in. over their entire length.

The fixture base is a cast iron T-shape, slightly shorter than the length of the rods. The top of the T is machined flat with respect to the base, to insure parallelism in the finished work. The work is held by two steel clamping arms which are linked together permitting slight movement, but always in the proper relationship to each other and to the column.

When the bolt through the fixture is tightened, the clamps are drawn toward each other, pulling the work onto the already machined flat. (The first flat is machined in this fixture, but several methods would have served as well, so it is not important.)

Because of the swivelled connectors, the clamping members always grip with equal pressure and hold the work accurately enough for the close tolerances needed. *W M Halliday, Lancashire, England*



Inexpensive Shop Comparator Measures to 0.0001 in.

This comparator was designed for use at the machine, and is easily made. By suitably proportioning the scale and pointer, the device will measure 0.0001-in. steps.

A ground steel rod is fitted to the reamed hole in the measuring column, and a steel ball is brazed onto the end of this rod. A knurled setscrew allows adjustment of this rod up or down, to accommodate different sizes of work.

The most important detail of construction is to be sure that all four arms are drilled at exactly the same spacing, and all eight swivel points must move without binding.

A tension spring keeps the measuring head in the "up" position until needed. Ground glass plate at the bottom provides an accurate base for the part being measured.

The pointer should be set with gage blocks, to a nominal dimension. When setting, the arms should always be at right angles to the column, to minimize parallax, and the gage blocks should be used when laying out the graduations on the scale. *G Lee, London, England*

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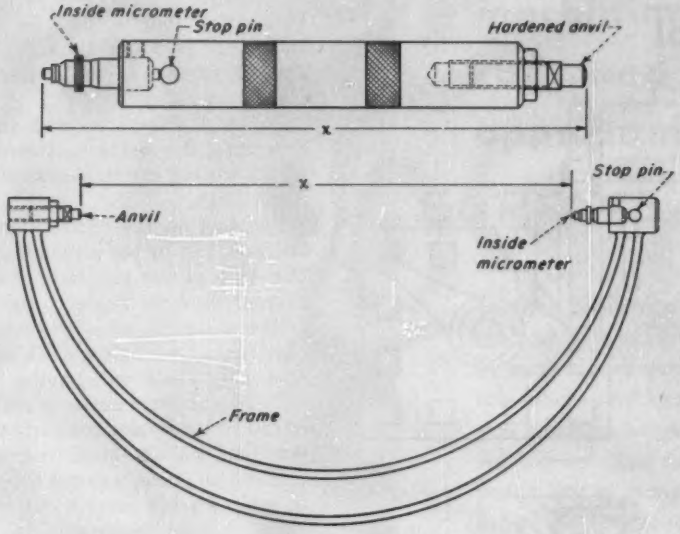
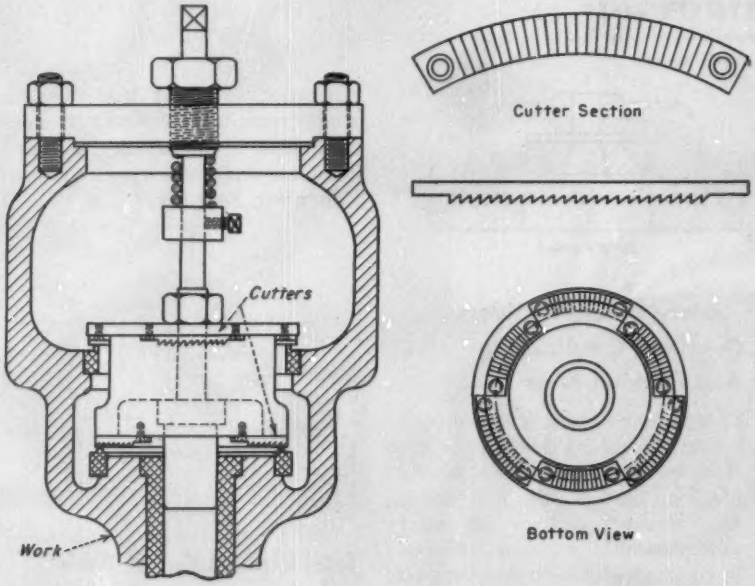


Frames Support Inside Micrometers

Usually only limited ranges of inside and outside micrometers are available, and occasionally work must be measured which is too large for conventional equipment.

We have avoided this problem by making the devices shown, adding to the capacity of our micrometers. Both inside and outside micrometers use the same principle—that of using an inside micrometer resting against a fixed stop, measuring across the work to a hardened anvil which can be adjusted for the initial size desired. *A Y Patel, Baroda, India*



Tool Steel Milling Inserts Machine Valve Faces

Shown here is a tool we made for facing valve seats, to make sure that the dimension between the two faces was held to close limits, reducing grinding time.

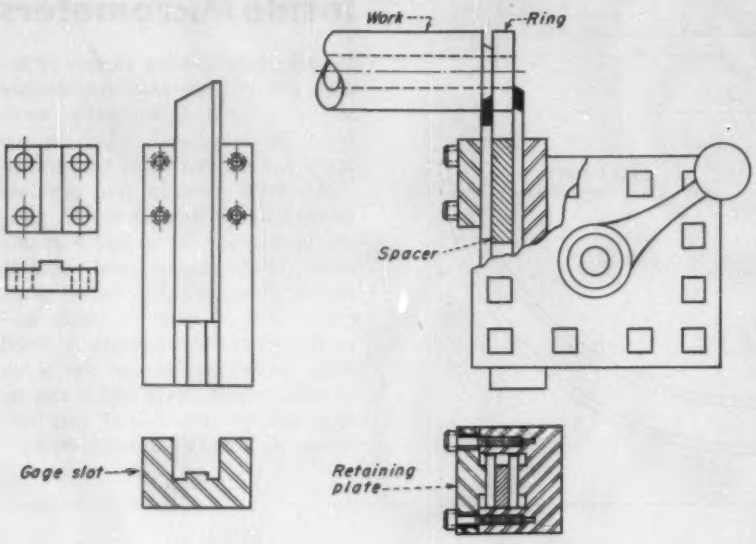
Because the seats were quite large, it would have been too expensive to make the entire tool of tool steel, so we made the body of the tool of cast iron, with milling inserts of tool steel.

The teeth were made from ½ x ¼-in. steel, formed to the diameter of the valve seats. Holes were drilled in the sections, so setscrews could hold the inserts on a faceplate while the milling teeth were cut. After the teeth were milled, the sections were annealed and tempered, and laid with cutting edges against a magnetic plane. Thus we could finish grind the inserts to exactly the same thickness. The inserts were then bolted to the cast iron holder, which had been turned so the dimension between the two valve seats would be correct. Feed of the tool is accomplished by the threaded rod at the top of the tool.

In the job for which this tool was made, we had to face 144 valves, which this tool did so effectively that finish-grinding of the seats required only a few minutes. *Carl Jensen, Copenhagen, Denmark*

When threading brass or other soft materials, the teeth of the dies often become clogged with the material, and spoil the work. To avoid this, thread an occasional piece of mild steel instead of the regular work. This will clean the teeth of the soft material, and will polish the die's threading surface. *M Barash, Haifa, Israel*

Two Blade Cutoff Tool



This cutoff tool is used for producing rings from tubing stock. The advantages of the design include:

The tool acts as its own thickness gage, the spacer between the blades setting the thickness of finished rings.

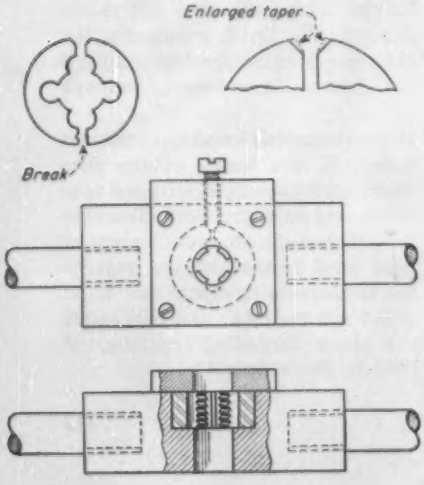
The tool on the right cleans up any burr left by the previous piece. The end of the left-hand tool is sharpened at an angle to the axis of the work, to leave the finished part free of burr on the ID, so the remaining stock will have a burr.

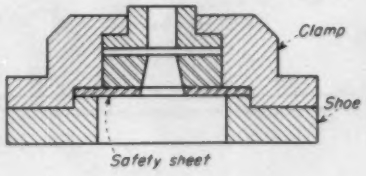
The right-hand cutter is extended out of the holder somewhat farther than the left-hand tool, so the tool can be placed against the stock to establish the correct cutter position before beginning to cut stock. Then the tool is advanced into the work to finish the cut. *H J Gerber, Stillwater, Okla*

Repair for Threading Dies

Slotted threading dies usually break at the point opposite to the slit, but they can easily be salvaged by the device shown here. The die-holder consists of a suitable piece of rectangular CRS in which a small recess is bored. The diameter of the recess is a sliding fit to the die, which is held in place by a thin cover. This cover is prevented from turning by a screw which engages in the original slit-opening.

For best results, it is convenient to enlarge on the taper of the slit. *F Strasser, Santiago, Chile*



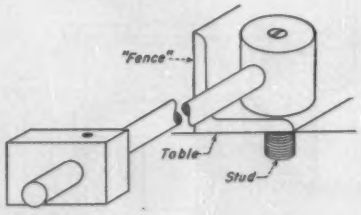


"Safety Sheet" Avoids Overload On Blanking And Forming Press

There are several safety devices to prevent press overloading, in case of too great stock thickness, double-feeding, hard stock, and so on. Among these devices are safety pins, hydraulic pitmans, and electronic devices, which stop the press in case of overload.

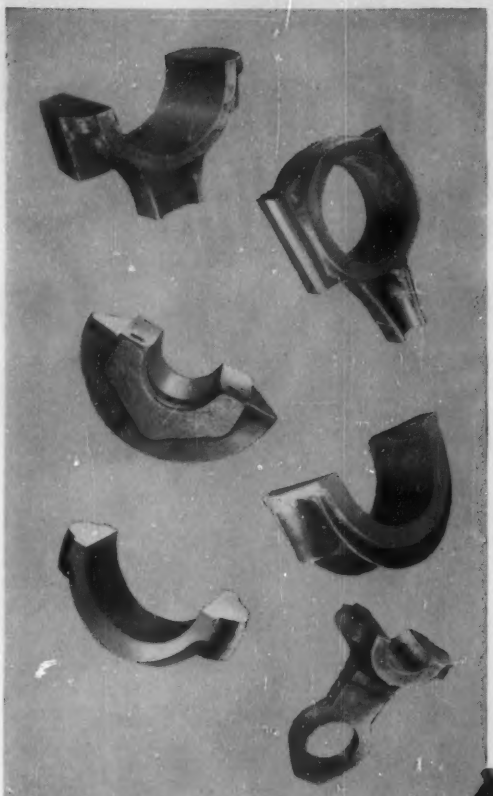
A simple, inexpensive substitute for these is the "safety sheet" shown here, which consists simply of an easily replaceable steel plate or sheet between die plate and die opening (which, in most cases, must be slightly larger than the die plate).

The thickness of the sheet must be carefully computed to resist normal cutting and forming force, but must shear at the pressure which constitutes dangerous overload. This is just below the maximum nominal capacity of the press. *F Strasser, Santiago, Chile*



Stud Extends Cutoff Table

To speed setup when cutting long pieces on an abrasive cutoff machine, we made the special stud shown here. This stud replaces the end-bolt which holds the angle-iron "fence" on the machine table. The stud has a cross-hole which receives a length of ½-in. CRS which may be graduated. A simple sliding stop is placed on the bar, and held in place with setscrews. *W Hartmann, Sheboygan, Wis*



machining connecting rods and caps an opportunity for

SURFACE BROACHING

Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

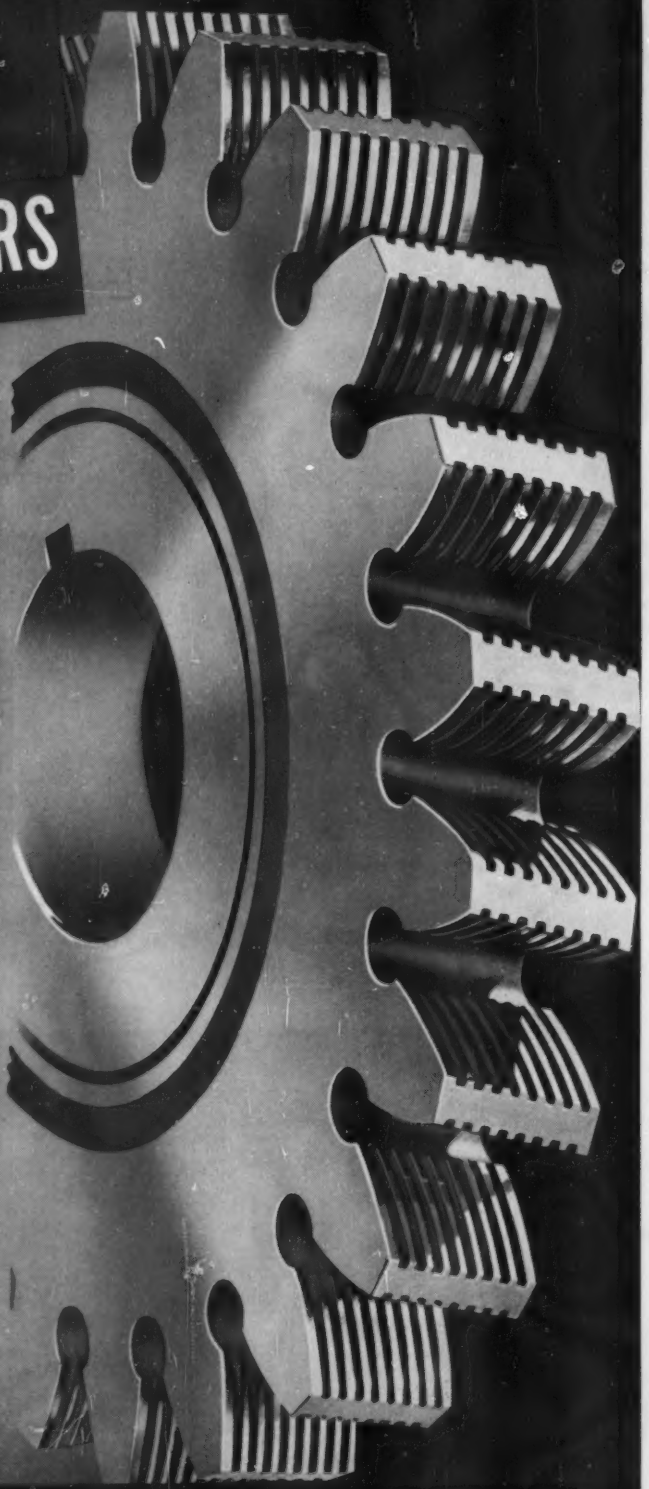
Holding Fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.

Continuous Type Broaching Machine Built in Five Sizes

FOOTBURT

SURFACE BROACHING

CHECK LIST FOR BUYERS OF SHAVING CUTTERS



Knowing the absolute necessity for QUALITY in your gear shaving cutters, you might consider these points the next time you order.

1. How much experience does the cutter manufacturer have?

   Since 1932 when National Broach built the first Rotary Gear Shaving Machine, this company has always been the largest producer of shaving cutters.

2. Has the cutter manufacturer a staff of engineer specialists who concentrate exclusively on cutter design?

   National Broach has such a staff.

3. Does the cutter manufacturer heat treat his own tools and is his grinding department temperature controlled?

   Every Red Ring Cutter is heat treated and controlled by Red Ring metallurgists and ground on special Red Ring grinders under precise temperature control.

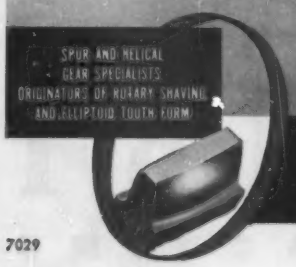
4. Does the cutter manufacturer prove every cutter design by actual try-out in his own plant before it is released?

   No new Red Ring cutter design is ever released otherwise.

5. Is the cutter manufacturer prepared to assist you in cutter development — involute modification, etc. when needed?

   National Broach has always maintained such a service for you.

For further information, write for Chapter 2, Modern Methods of Gear Manufacture.



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

7029

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

How to Braze Carbide-Tipped Tools

COURTESY ADAMAS CARBIDE CORP, KENILWORTH, NJ

SHANK PREPARATION

1.. Inspect shank for burrs and distortion of pocket. Make sure sides of pocket are at right angles to face. Check for any damage to shank or pocket, because tip must be snug fit in pocket.
2.. Correct any defects found.
3.. Clean pocket with carbon tetrachloride, sandblasting first if rusty.

PREPARATION OF BRAZING MATERIALS

1.. Use sandwich braze on all Grade C-3, C-4, C-7, and C-8 tips regardless of size.
2.. Use sandwich braze on Grade C-2 and C-1 if tip is Style 2230 or larger. Use sandwich braze on Grade C-1 or C-5 if tip is Style 3390 or larger.
3.. Use plain silver solder strip 0.005 in. thick in all other cases.
4.. Make sandwich braze for each tip of 0.005-in. silver solder, 0.010-in. copper shim, and another 0.005-in. silver solder strip; or use commercial sandwich made up in this combination.
5.. Make sure commercial sandwich, or copper shim, has no burrs to cause air pocket or improper brazing thickness. Eliminate burrs by placing material on flat plate and tamping with another flat plate.
6.. If copper shim is oxidized, clean with emery.
7.. Cut brazing material to same size as tool tip; if radius tip is used, cut same on brazing material.
8.. Clean brazing material with carbon tet and do not touch after cleaning.
9.. Remove from carbon tet with tweezers and dry with air jet. Replace carbon tet frequently to get rid of scum which might contaminate work.

PREPARATION OF TIPS

1.. Inspect tips for size and shape to fit pocket.
2.. Make sure tips have been sandblasted clean and that there is no oxide present.
3.. Clean tip with carbon tet. Remove from cleaner with tweezers and do not handle with fingers.

PREPARATION OF SHANK

1.. Clean pocket with carbon tet and blow dry.
2.. Grip shank in vise with pocket level or tilted back slightly. Make sure shank cannot move when pressure is applied to tip while braze is setting.
3.. Coat pocket and surrounding area with flux. Be liberal! Flux is cheaper than the cost of a tool failure caused by a poor braze.
4.. If separate silver solder and shim are used:
   a. Remove solder from carbon tet with tweezers, blow dry, and place in fluxed pocket. Flux top of solder.
   b. Remove copper shim with tweezers, blow dry, and place on fluxed silver solder. Flux top.
   c. Remove second piece of solder with tweezers, blow dry, and place on fluxed copper. Flux top of solder. Caution: make sure radii of brazing materials and pocket line up.
5.. If prepared brazing sandwich is used:
Remove sandwich from carbon tet with tweezers, blow dry, and place in pocket, lining up radii. Apply flux to top of sandwich.
6.. Make sure there is enough flux on walls of pocket.
7.. Remove tip from carbon tet with tweezers, blow dry, and place in tip pocket with radius in right location. Apply flux to top of tip.

BRAZING

1.. Use an oxyacetylene torch with these tip sizes:

Up to 3/8-in.-square shank	No. 4
Over 3/8-to 5/8-in.-square shank	No. 6
Over 5/8-to 1-in.-square shank	No. 8
Over 1-in.-square shank	No. 10

2.. Ignite acetylene first, then add oxygen to produce a soft flame.
3.. Oxidizing flame will burn shank or tip.
4.. Hold tool tip down with coated electric welding rod or tang of an old file. Apply flame to bottom of shank, under the tip.
5.. Keep torch moving constantly so shank becomes an even cherry red all around tip. This is very important, as a braze is easily ruined at this stage.
6.. When braze material melts—indicated by flow of braze up the wall between tip and side of pocket—apply flame momentarily to the tool tip.
7.. When flame is applied to tip, move tip back and forth in the pocket with the rod. This is called "puddling" or wiping in the braze. It is important because it insures complete wetting with the braze.
8.. Remove torch and maintain pressure on tool tip with rod until braze sets.
9.. Remove tool from vise with pliers and place in box of powdered lime or asbestos. Allow tool to cool slowly until it can be handled. Do not cool by quenching in water.
10.. Remove excess flux by soaking in hot water or by sandblasting. Inspect tool. Good braze is indicated by lack of voids along all edges that show a braze line, and by a braze line of even thickness. Excessive heat is shown by the excess braze which has run over the sides being rough and pitted.

VLIER Ready-Made Spring Plungers

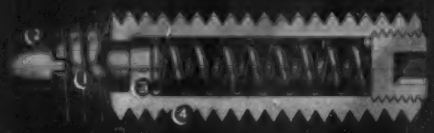
Eliminate Costly, Custom-Made Devices!

Provide accurate, pre-set end pressures for every need!

Why waste toolmaker's time machining make-shift devices to provide necessary spring loads? Standardizing on low-cost, ready-made Vlier Spring Plungers speeds jig and fixture manufacture and insures accurate, uniform loading, resulting in more accurate machining, fewer rejected parts!

40 TYPES AND SIZES! Hundreds of thousands of Vlier Spring Plungers are now in use positioning parts in dies, jigs, and fixtures, as detents, locating pins, and die ejectors... wherever accurately-controlled, constant spring pressure is needed! *Order a wide assortment of types and sizes from your Vlier distributor today!*

1. **Plunger end telescopes completely within body!** End pressure is determined with plunger end telescoped 50%.
2. **Case-hardened plunger end gives high wear resistance!** Ductile core overcomes brittleness, reduces hazard of failure under impact common with hardened, high-carbon steel.



3. **Large bearing surface** assures perfect alignment at any part of plunger travel; eliminates binding and reduces wear!
4. **Rust-proof finish** prevents freezing in the fixture!

4 Nose Types Available!

Standard Nose — Cylindrical plunger end is accurately radiused to speed loading and unloading of jig or fixture. End pressures available from 3# to 42#, various diameters and lengths.

Silvernose — Cadmium-plated plunger ends identify light (1# to 7#) end pressures. Special spring design developed for fast, repetitive operations, give millions of flexes without fatigue failure!

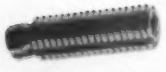
Hexnose — Plunger end is hexagonal-shaped. Can be easily and quickly installed, adjusted, or removed with an ordinary end wrench! End pressures available from 8# to 12# in Standard type, and from 2½# to 6# in Silvernose type; various diameters and lengths.

Plastic Nose — For use with aluminum, brass, and other soft, easily marred materials. Plastic plunger end reinforced for less deformation under loading. Excellent wear resistance, high dielectric strength! End pressures available from 5# to 18# in Standard type, and 1½# to 7# in Silvernose type; various diameters and lengths.

VLIER ENGINEERING

4552 BEVERLY BOULEVARD
LOS ANGELES 4, CALIFORNIA

TORQUE THUMB SCREWS • SPRING PLUNGERS • SPRING STOPS • FIXTURE KEYS • TOGGLE PADS • KEY KLIPS



Vlier Screw-ball Clamps — Overcome angular irregularities in clamping set-ups. Prevent surface damage. 17 sizes!

Vlier Key Klips — Eliminate lost hex keys! Speed positioning of part in fixture. 3 sizes!

Vlier Torque Thumb Screws — Apply accurate, controlled end pressures to the workpiece. 4 models; 19 sizes!

Vlier Spring Stops — For use where there are no wall sections in fixture. Two models: 14 and 32 lbs. end pressure.

Vlier Toggle Pads — Assure clamping of parts with irregular surfaces. 5 sizes: for use with standard screws, toggle clamps and pliers.

Vlier Fixture Keys — New 5-Way Key fits all common mill table slots. 3-Way model also available.

How to Grind Carbide-Tipped Tools

COURTESY ADAMAS CARBIDE CORP, KENILWORTH, NJ

PREPARATION

1.. Check shop order to be sure you have the right tools to be ground.
2.. Have chart at hand showing proper angles for particular style of tool.
3.. Have this equipment at hand: Movable-leg protractor, set of radius gages, wheel dresser for silicon-carbide wheel, wheel cleaning stick for diamond wheel, Ouija board or other adjustable fixture.*
4.. Have small tables to right and left of grinders; one for unground tools, the other for finished tools.
5.. Check coolant pump and make sure there is a sufficient flow of coolant to the wheel.
6.. Check that wheel is tight on spindle.
7.. Spot check tools for cracks or bad chips.

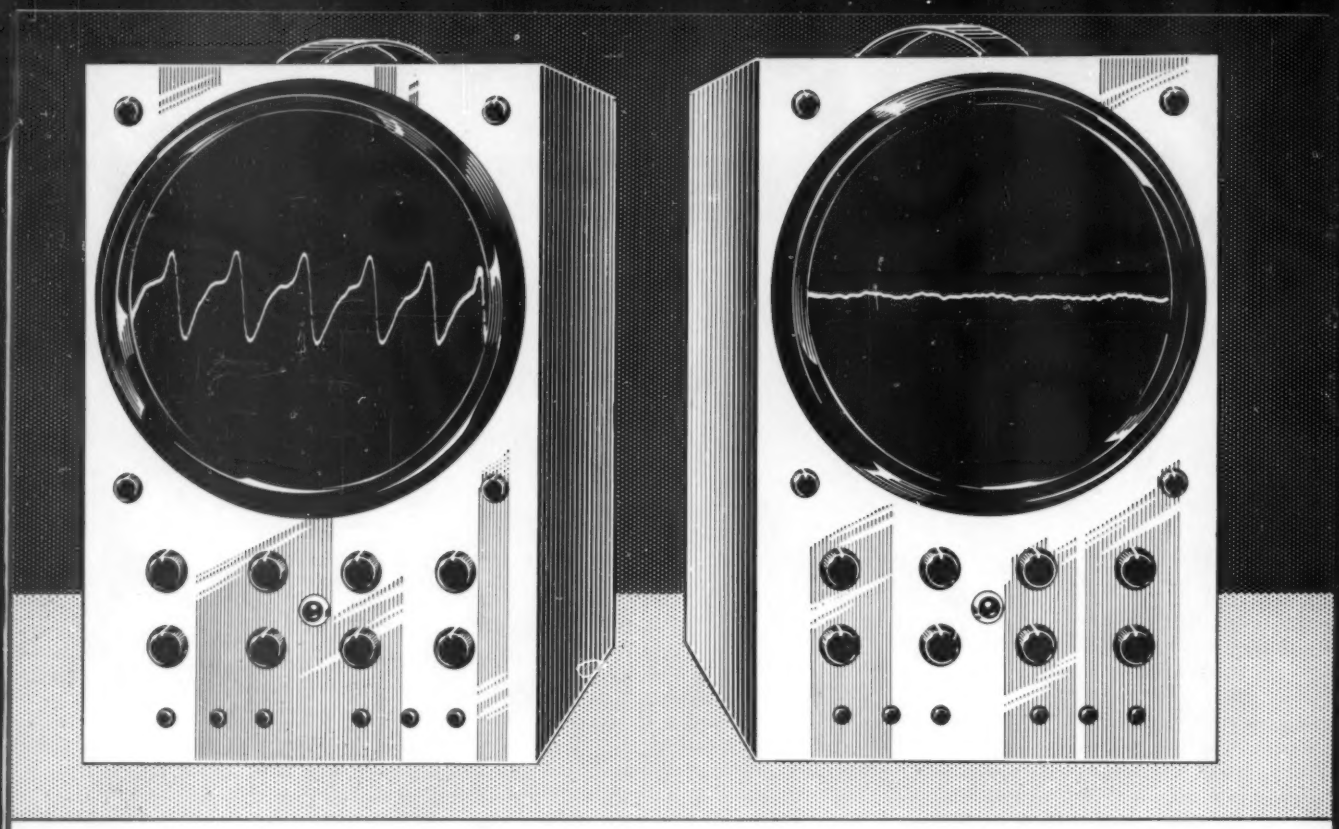
ROUGH GRINDING

1.. Use silicon-carbide wheel for rough grinding, and dress frequently if it does not cut freely or tends to pound and vibrate.
2.. Have direction of rotation such that grinding will be down into the cutting edge, not away from it.
3.. New operator should grind wet until he becomes familiar with operation. Later, he may use his own discretion. Grades C-3, C-4, C-7, and C-8 should always be ground wet to avoid heat cracks.
4.. Set angles on table and Ouija board and grind top of tool to produce proper side and back rake angles.
5.. Grind top enough to clean up entire tip.
Note: Keep tool moving across face of wheel. Do not let it dwell in any one place.
6.. Check side and back rake angles within plus or minus 2°.
7.. Set table and Ouija board to correct angles and grind front relief angle which will also produce the end cutting edge angle.
8.. Grind to clean up and leave a slight tip overhang at the bottom where it meets the steel.
9.. Check front relief angle within plus or minus 1°.
10.. Check end cutting edge angle within plus or minus 1°.
11.. Set correct angles on table and Ouija board and grind side relief angle, which will produce side cutting edge angle.
12.. Dress wheel if necessary.
13.. Grind tip to clean up, leaving slight overhang at bottom of tip.
14.. Check side relief angle and side cutting edge angle within plus or minus 1°.

FINISH GRINDING

1.. Use diamond wheel for all finish grinding.
2.. Clean wheel with dressing stone when it becomes clogged and does not cut freely.
3.. Always use coolant for diamond-wheel grinding.
4.. Keep tool moving back and forth across face of wheel. Do not dwell.
5.. Have direction of wheel rotation down into cutting edge, not away from it.
6.. Never grind into steel shank with diamond wheel, or it will glaze or load, cause cracking.
7.. If it looks as though you are going to hit the shank, stop, and grind steel with another wheel.
8.. Set angles on table and Ouija board to grind correct side and back rake angles on top of tool.
9.. Grind to clean up entire surface and produce a good finish.
10.. Check angles frequently and hold side and back rake within plus or minus 2°.
11.. Set table and Ouija board to correct angles and grind front relief angle and end cutting edge angle. Do not hit the steel. Leave slight tip overhang.
12.. Check both angles within plus or minus 1°.
13.. Set table and Ouija board angles and grind side relief angle and side cutting edge angle.
14.. Grind tip to clean up. Do not hit steel. Leave slight tip overhang.
15.. Check side relief and side cutting edge angles within plus or minus 1°.
16.. Grind nose radius. This is the most difficult operation.
17.. Use a metal-bonded diamond wheel because it offers higher resistance to grooving
18.. Set correct relief angle on table, but do not use Ouija board.
19.. Give tool a full swing at each pass, from a tangent to the end cutting edge angle to a tangent to the side cutting edge angle.
20.. Do not stop or dwell, or a flat will be produced.
21.. Use light pressure because radius will develop faster than you realize.
22.. Check radius frequently with radius gage.

* Grinding fixture made by Carbide Processors Supply Co, Detroit.



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008″ jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-12.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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Refiners of the famous Blue Sunoco Gasoline and Dynalube Motor Oils

How to Inspect Carbide-Tipped Tools

COURTESY ADAMAS CARBIDE CORP, KENILWORTH, NJ

EQUIPMENT REQUIRED

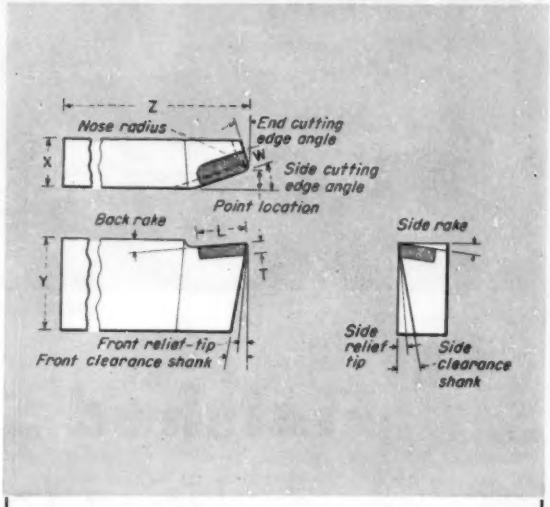
1.. Protractor, movable-leg type.
2.. Set of radius gages.
3.. Set of grinding inspection blocks (carbide) with three different grinds.
4.. Set of charts showing angles for each style of standard lathe tool.
5.. Large bench-type magnifier, preferably with built-in light.
6.. Crack-inspecting equipment—Red Line, Zyglo, or similar.
7.. Paint for shanks (Optional).
8.. Strippable coating equipment (Optional).

VISUAL INSPECTION

1.. Check tools against shop order.
2.. Check braze. If porosity or voids are visible, consult foreman before accepting.
3.. Check surface finish against inspection blocks.
4.. Inspect cutting edge for minute chipping or cracks. If in doubt about a crack, have the tool checked by the crack-detection equipment.
5.. Make sure tools with Grade 434 tips are stamped "Minimum feed 0.015."

PHYSICAL INSPECTION

1.. Check side rake angle, plus or minus 2°.
2.. Check back rake angle, plus or minus 2°.
3.. Check front relief angle, plus or minus 1°.
4.. Check end cutting edge angle, plus or minus 1°.
5.. Check side relief angle, plus or minus 1°.
6.. Check side cutting edge angle, plus or minus 1°.
Note: In checking these angles with the protractor, measure from the unground or unmilled portion of the shank.
7.. Check location of cutting edge. Edge should not extend more than 0.010 in. above top of shank or beyond end or side of shank on tools with 1-in.-square or smaller shanks. On shanks larger than 1 in., figure may be 0.015 in.
8.. Check nose radius with radius gage Make sure there are no flats on the radius and that it blends tangent to end cutting edge angle and side cutting edge angle.
9.. Paint shanks, if desired, to indicate cutting grade of carbide. One color (red) for steel-cutting grades, another (gray) for cast-iron and nonferrous-cutting grades.
10.. Dip-coat carbide end of tool with strippable plastic to protect edge during storage (if desired).



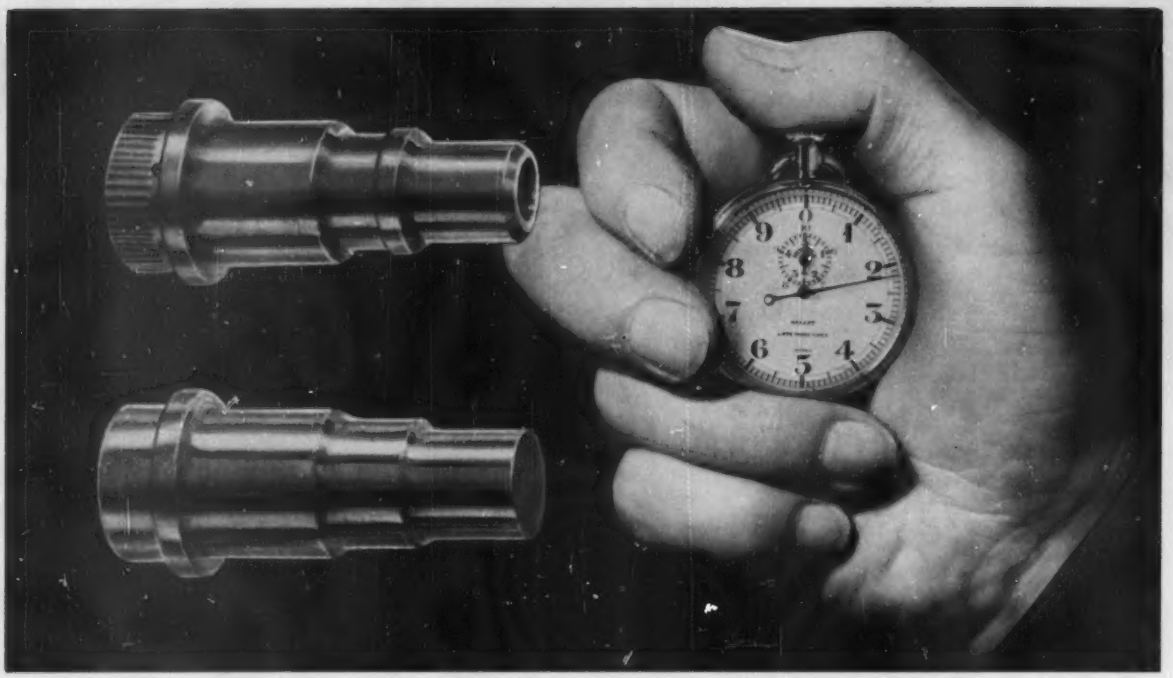
TIP:

End Cutting Edge Angle	Plus or minus 1°
Side Cutting Edge Angle	Plus or minus 1°
Side Relief	Plus or minus 1°
Front Relief	Plus or minus 1°
Back Rake	Plus or minus 2°
Side Rake	Plus or minus 2°
Nose Radius	Maximum 1/32"
Point Location	Plus or minus 1/64"
Tip Thickness—T	Plus or minus 1/64"
Tip Width—W	Plus or minus 1/64"
Tip Length—L	Plus or minus 1/64"

SHANK:

Front Clearance	Plus or minus 1°
Side Clearance	Plus or minus 1°
Shank Thickness—X	1" or less + 0.000 – 0.010
	Over 1". + 0.000 – 0.015
Shank Width—Y	1" or less + 0.000 – 0.010
	Over 1". + 0.000 – 0.015
Shank Length—Z	Up to 1" square & 1 x 1¼ ..... ± 1/8
	Over 1" square & over 1 x 1¼ .... ± ¼

STANDARD TOLERANCES and nomenclature for carbide-tipped lathe tools



Finished 50% faster

Using Ledloy from Ryerson

By the time the B-1113 piece was finished, you'd be halfway through a second Ledloy piece. Such greater speeds and feeds are possible with Ledloy because Ledloy contains a *built-in lubricant* which substantially reduces the friction between the steel and the cutting tool.

That built-in lubricant is *lead*—so finely dispersed through this free-machining, open-hearth steel that you can't see it with a microscope. The addition of this small percentage (.15-.35) of lead has no effect on the mechanical properties of the steel EXCEPT to greatly increase machinability.

Ryerson Ledloy machines up to 50% faster than B-1113 . . . tool life is extended as much as 200% . . . and net savings of 25% and more are effected. And Ledloy machines to an unusually clean, smooth finish—case hardens effectively —and bends, crimps, swedges or rivets easily.

Ask your Ryerson representative for the facts about Ledloy or write us direct for engineering data. Ryerson was the first to stock Ledloy and today your nearby Ryerson plant carries the world's largest stocks of Ledloy rounds, squares and hexagons in a wide range of sizes for immediate shipment when you call.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

TUBING—Seamless & welded, mechanical & boiler tubes

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot & cold rolled, many types & coatings

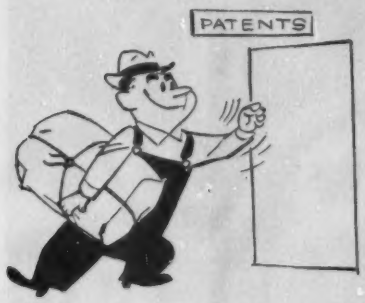
MACHINERY & TOOLS—For metal fabrication

RYERSON CERTIFIED STEELS

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .



Induction Reamer

FROM TIME TO TIME, the US Government Patents Board releases a list of government-owned inventions available for license. You may find some of these ideas useful, or at least unusual. More details are available from Commissioner of Patents, US Dept of Commerce, Washington 25, DC. Include 25c per patent, plus title and number. Here are typical ones:

Method of "welding" carbon to molybdenum, No. 2,431,975—Dec 2, '47, shows how to join these two contacting materials by using an atomic-hydrogen flame at atmospheric pressure while applying molybdenum as a welding rod. Welding is possible by other methods of heating as long as a protective atmosphere is used.

Induction reamer, No. 2,514,116—July 4, '50, utilizes an unattached circular cutting tool which carries a squirrel-cage motor winding. For long-tube reaming, this cutter is rotated inside the tube by a rotating magnetic field generated through the squirrel-cage winding. This is "gun-reaming" without a spindle and with *the cutting head acting as its own drive "motor".*

Electric micrometer, No. 2,521,917—Sept 12, '50, measures the distance between two metal surfaces by using the physical relationship between distance and voltage. Design comprises a supply circuit having a variable transformer with its primary coupled to input terminals and with the secondary output terminals coupled to the primary terminals of a high-tension transformer. The secondary circuit of the latter is connected, through secondary output, to an indicating circuit which includes a glow-discharge tube and selector switch. Measurement is read from voltmeter calibrated in terms of distance.

Drill tool, No. 2,569,854—Oct 2, '51, is used to cut holes in glass, quartz, and other hard materials. The cutting edge is the edge of a cup, the handle or shaft having a central channel and transverse channels extending therefrom. When the drill is immersed in a cutting liquid containing abrasive particles, the centrifugal action will continuously circulate the abrasive suspension, thus providing a continual source of fresh cutting action.

Process for machining porous metals, No. 2,663,928—Dec 28, '53, prevents plugging of surface pores of porous metals during cutting and forming operations. Pores are filled with fluid oxalic acid at between 200 and 260 F. Then metal is cooled to permit metal to solidify. After machining, acid is removed by reheating—without damage to work. Acid can be re-used.

Operate-It-Yourself Exhibit

HOW MACHINES WORK is being shown to the public at "Worthington City," Worthington Corp's recently opened basic machinery educational exhibit at 99 Park Ave, New York. The visitor can do such things himself as (1) turn a generator to run an electric motor and light a bulb, (2) operate a lever-gear combination to lift a load, or (3) turn an impeller on either a centrifugal or positive-displacement pump and see the water level increase as he turns it faster. A three-dimensional diorama shows the relationship of machines to both industrial operations and home life in a typical US community.

Isolation Mount

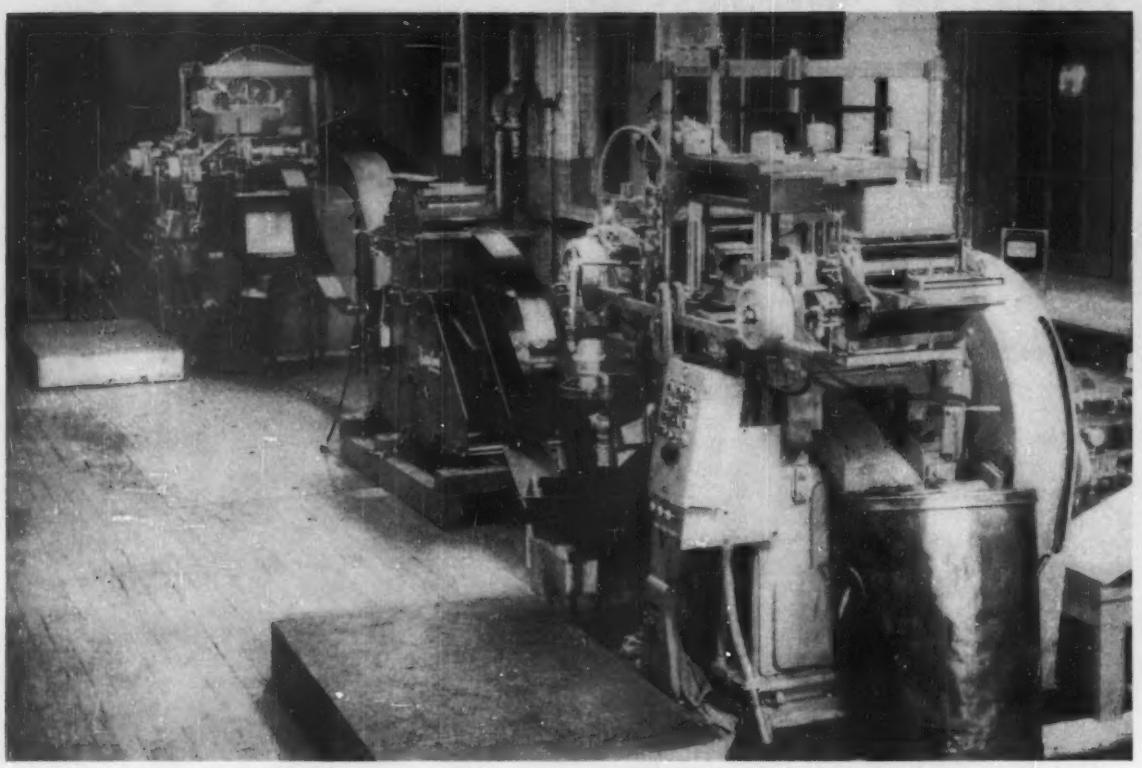
CLOSER TOLERANCE REQUIREMENTS are bringing to the fore the problem of setting and leveling machine tools. An increasing number of plants are setting precision machines on vibration-isolating mounts rather than bolting them rigidly to the floor. Thus, passing trucks and floor vibration do not destroy accuracy or finish. All machines in the machine-shop lab at Purdue, for example, are on isolator mounts. They can be rearranged easily and the floor is not cut up. Machines can be placed with no delay, and work precision and finish are improved. . . . Such mountings do require, however, a sub-base for non-rigid machines, and suggest redesign of the tool in some cases to assure the necessary rigidity. In Canada, at Victory Aircraft during WW II, fixtures for close-tolerance assemblies were rigid bridge structures, designed around a truss or tubular base with 3-point support. Passing trucks or vibration did not destroy accuracy.

Tongue-Tied Dictators

INARTICULATE EXECUTIVES, the bane of the stenographer's existence, may soon be a thing of the past at Minneapolis-Honeywell's Brown Instrument Division, Philadelphia. US businessmen are known the world over as fast-talking, aggressive executives, but they become tongue-tied and hand-tied when it comes to writing the simplest letter—"taking refuge in cautious wordy and involved writing"—according to Brown's training director C L Scheetz. Now, Brown instrument is teaching its top personnel (1) how to organize their thoughts before dictating, (2) how to talk clearly (and *not* through a pipe or cigar), and (3) how to use simple, clear 21- to 30-word sentences. The Division, which sends out some 3000 letters daily, plus some 500 inter-office memos, figures it will save hundreds of thousands of dollars a year by training its executives not to "write like a man walking on stilts."

Office Spread

TIMKEN and Cincinnati Milling have moved their Cleveland sales offices to outlying or suburban areas, and Heald Machine is expected to move out soon. Rising rents, traffic, and the parking problem (for both employees and customers) are major reasons. Also, many married women will work near home, but will not "commute" into town. Timken has leased a special building 10 miles from the downtown area—has taken the same step in Milwaukee, Atlanta and Los Angeles. "The Mill" is about a block from Timken, is also "suburbanizing" in Detroit and Chicago.



Press-replacement study

JOHN R NIKOLAIS, div supt, WALLACE BARNES CO, DIVISION ASSOCIATED SPRING CORP, BRISTOL, CONN

When you can make two do the work of five, and get lower costs, that's news! In the flat-spring business, you have got to have presses with four characteristics: (1) rigidity, (2) ability to take eccentric loading, (3) high speed, and (4) ease in changing dies. If you have these, you remain competitive, and you can go after some of the business that was just a bit out of reach price-wise.

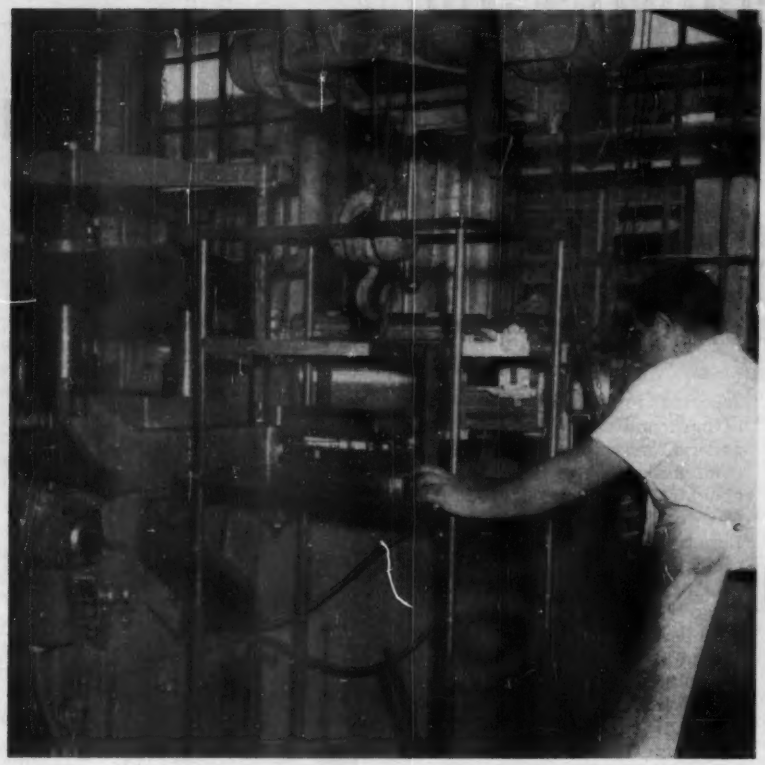
We threw out five old conventional presses and replaced them with two machines, a 60-ton — and later a 100-ton — Henry & Wright dieing machine. By introducing high-speed production equipment, we have stepped up our output of flat springs and lowered our unit costs. From a business standpoint, results are two-fold. First, we have been able to hold accounts. Second, we have been able to review inactive quotations, and find that we can now meet competition, because of the higher productivity of the new equipment.

When I say that we produce "flat springs," I take in a lot of territory. The term has been changed in meaning during recent years. Today, virtually any metal strip may be classified as a spring. Thus we make flat springs in endless variety. Generally speaking, we use high-carbon strip but also some stainless-steel and beryllium stock. Orders range anywhere from a single part to millions, with the average falling at about 10,000 pieces.

Quick die changes are a must in our business. Rush orders are a part of the routine. Often we are compelled to turn out an order in 24 hr. To do this, we are frequently required to interrupt a run, change dies, run off the rush job, then go back to the original one. Or we may have a succession of small orders. Sometimes, we must make as many as three die changes in 8 hr, and on the average we change dies on our Henry & Wrights at least twice a day. We have got to be able to do this and still have sufficient operating time left over to run off a job in economical quantities.

High-speed operation is another must. In our shop, presses are run at the maximum speed permitted by die design. At the same time we want to be able to put any job on any press, provided the job is within the machine's capacity.

Much of our work requires the use of progressive dies, and it is virtually impossible to avoid eccentric loading. Here, again, we have found dieing machines able to accept eccentric loads, so we



DIES ARE CHANGED as often as three times in 8 hr, with the average being two die changes per day per machine. Faster service, plus more versatility in respect to jobs handled and dies accepted, are gained from two Henry & Wright dieing machines. One is rated at 60 tons, the other at 100 tons. They replaced five old conventional presses

pays off for spring maker

are able to use any die on them without hazard in this respect. In fact, we can use any well-designed die on these machines, whether it be progressive or compound.

Die life is increased two or three times over what it was with our five old presses. To us, this is an important consideration, because our investment runs into millions.

We use the dieing machines at maximum capacity without hesitation. This may not sound like good practice, but we have found it safe, and an important factor in achieving economical piece-part costs. The dieing machine allows for pull or push operation on a double roll, allowing us to run two strips. However, the machine will function efficiently with a single roll, when there is no skeleton to pick up.

Assembly operations are permissible on some jobs, when the Henry & Wrights are used. Thus, we are able to supply assembled units as well as components more quickly to the customer. This facility of use now enables us to select the job for the press, rather than the other way around—again an important factor when jobs change frequently.

Our press-replacement program gives us a better grip on the future. It's seldom that we can change raw materials to reduce costs, because most of our jobs carry customer-applied specifications. Our opportunity lies in reducing manufacturing costs. This we have done. And when we became aware that new efficiency would permit us to reopen inactive quotations, we started a review of all our accounts, active and inactive. From the results of this study, we expect both to hold business and to build it.

"Chip? He just stepped out back to speak to a hammer he hit his thumb with."

News of Metalworking . . .

ASME MEETING: Automation Is Still

Other topics of particular interest to Metalworking at the mechanical engineers' recent New York meeting included tap drills, tool-chip temperatures, milling cutter design, grinding problems and linear programming. The highlights:

NEW YORK — Again this year, automation and its effects on industry came in for the lion's share of attention at the annual meeting of the American Society of Mechanical Engineers, held at the Statler, McAlpin and Governor Clinton hotels here November 29-December 4.

In one of several papers on automation presented at the meeting, F R Swanson, director of engineering, Sundstrand Machine Tool Co, listed five basic requirements for automatic machines:

- Safety for the operator and maintenance men.
- Safe failure of components with respect to machine and work.
- Long life of electrical components.
- Ease of maintenance.
- Flexibility of control.

A new set of standards for hydraulic controls must be considered, he said, because the development of automation has produced marked changes in circuit design.

Design features that had to be developed to produce dependable transfer machines were reviewed by J H Mansfield, engineering consultant, Greenlee Brothers & Co. Although transfer machines look complicated because of their size, he said, the electric and hydraulic components are the same as for standard machine tools. It is just that more of them are required for interlocking of operations and conveying of parts.

Control of down time is essential, said K O Tech, chief engineer, The Cross Co, and the greatest challenge today is in reducing it. Automatic programming for each individual tool is controlling the predictable down time. The unpredictable can be eliminated by simpler, better, operating, and more rugged mechanisms.

What tap-drill size?

Effect of tap-drill size on the strength of threaded assemblies was reported for various combinations of hard and soft ferrous metals. In general, maximum strengths of all combinations were developed at about 50% thread height, said C J Oxford, Jr, research engineer, National Twist Drill and Tool Co, and J A Cook, research engineer, National Metal Products Co. They conclude that exact tap-drill size is unimportant in static assemblies if thread height exceeds 60%. (Considerable saving in tapping costs can be realized by reducing the thread height from 75 to 60 or 65%.) For short lengths of engagement or less than 50 % thread height, the range of oversize encountered in drilled holes may become significant and holes should be sized by reaming, boring, or other precision methods.

Tool-chip Temperatures

A rapid method for computing the temperatures at the interface between tool and chip was presented by B T Chao and K J Trigger, professors, University of Illinois. Maximum temperatures occur at a point near the trailing edge of contact at conventional speeds and feeds with carbide tools. Their analysis reveals that usually heat is conducted from the tool into the chip over a small region close to the cutting edge. Thermal conductivity of the tool has little effect on the mean cutting temperature, but does influence temperature distribution. This distribution is an important factor in crater wear and further work is in progress on this point.

Milling Cutter Design

Final report on a research program sponsored by Office of Research and Development was given by O W Boston, chairman dept of production engineering, University of Michigan, and W W Gilbert, machinability consultant, General Electric Co. Studying effect of tool design in face milling cast iron and steel, they recommended the following cutter design:

Angles, degrees	Cast Iron	Steel
Axial rake	0	20
Radial rake	12	−10
Face relief	12	10
Peripheral relief	12	10
Face cutting edge	2	2
Peripheral cutting edge	45	45

In both cases they suggest a chamfer of 0.1 in. at 45° or a nose radius

HANDING OVER THE REINS OF OFFICE at ASME's annual meeting was Retiring President Lewis K Sillcox (left), honorary vice chairman of the board, New York Air Brake Co, New York, to Incoming President David W R Morgan (right), vice president, Westinghouse Electric Corp, Pittsburgh. Looking on is ASME Secretary C E Davies

Engineering's No. 1 Challenge

of ⅛ in. For steel, they suggest blunting the peripheral cutting edge to 0.010-in. width at a –22° from cutter axis.

Residual Grinding Stress

Increased use of high tensile steels that must be ground makes the study of grinding stresses under such conditions more important. Research at the University of Michigan was reported by L V Colwell, M J Sinnott, and J C Tobin. Investigating SAE 4340 by X-ray diffraction and optical interferometric methods, they found that critically high stresses do not exceed 0.002 to 0.003 in. below the ground surface, but vary up to 100,000 psi in tension and 135,000 psi in compression, depending on hardness level of the steel and grinding severity. Light grinding produces compressive stresses and heavy grinding produces tensile stresses.

Precision Grinding

The influence of conformity between wheel and work in precision grinding was discussed by R S Hahn, consulting engineer, Heald Machine Co. Experimental results indicate that the rate of metal removal varies as the 0.18 power of the curvature difference. It was found that there are two types of grinding action. In one, the rate of removal is proportional to work speed and independent of wheel speed. In the other (entered at higher work speeds), the rate is independent of work speed and dependent on wheel speed.

Automation and the Engineer

"The most exciting tool development of the past 20 years" is the way Milton O Cross Jr, president of the Cross Co, Detroit, described the transfer machine at an ASME session in New York. Here are some of the results of automation predicted by Mr Cross: (1) a broad upgrading of labor, under which the unskilled will become highly trained maintenance men, (2) present-day skilled workers will become technicians, (3) labor will become capital investment, rather than a current cost, and (4) increased machine capacity will reduce human drudgery and working hours to provide more leisure. Recent developments in production programming, Mr Cross added, hold downtime for tool changes to as little as 5% of total production time, regardless of how many tools are incorporated into a singlemachine. Dull tools, he said, will soon be replaced automatically, without shutting down production at all. Advances in automation and additional integration are leading to automatic sub-assembly of various component parts, and will soon make completely automatic final assembly possible, eliminating "one of the last frontiers where production bottlenecks are encountered," he said. And management itself will need a revamping, Mr Cross concluded — basing its decisions on carefully selected objectives and long-range decisions, but with the ability to adapt its process to new circumstances while maintaining a going business. Successful management under the new technology must create mass purchasing power and mass purchasing habits, Mr Cross said.

Milton O Cross, Jr

TOOL AWARDS

NEW YORK — The 1954 Machine Tool Awards were won by George N. Levesque and Frank G East. The awards, for the best papers on machine tool design, were established last year by the National Machine Tool Builders Association. Presentation was made at the annual banquet at the ASME meeting here.

George Levesque, director of research, Brown & Sharpe Mfg Co, was honored for his paper, "Testing Methods for Production of Accurate Slideways."

Frank East, vice president and general manager, Hamilton Gear and Machine Co, received his award for the paper, "Proposal for a Standard Design for General Industrial Course - Pitch Cylindrical Worm Gearing."

Assembly Line Balancing

Several aspects of operations research and linear programming were considered at the sessions. M E Salveson described the initial experience of the Major Appliance Division, General Electric Co, in balancing an assembly line by analytic procedures. He reported that substantial improvements in productivity were achieved in each of several cases in which it was used. It is also expected that with machine computation to compute balances for different levels of output, the lead time required to change production rate can be reduced by two to three weeks.

One interesting aspect was that closely balanced assembly lines have operated as 100% inspection stations, there being no slack time available on the assembly line for touch-up work that should have been done earlier.

An interesting application of quality control to a 100% inspection operation was reported by D F Flanders, Allison Div, GMC.

The average and range-control chart common in sample inspection techniques is applied to incoming forgings that must be inspected ultrasonically 100%. The charts may reflect approaching trouble before rejections start, showing up a faulty heat or a bad practice before it has involved a large number of parts.

The general area in which linear programming can be applied to production engineering was discussed by E L Arnoff, Case Institute of Technology. Among the problems dealt with by this method are:

- Determination of an optimum production program.
- Effect of market and product mix restrictions.
- Use of overtime or more shifts.
- Improvement or replacement of equipment.
- Purchase of new equipment.
- Effect of changes in sales price of a product.

GOVERNMENT TOOLS: Too Many Cooks

An industry-Pentagon investigating team thinks so. Its recommendations: centralized control of government machine tools, continuous inventory, and standard pricing, terminology and recording. A new plan is on Secretary Wilson's desk now

WASHINGTON — A comprehensive plan to overhaul military management of government-owned production equipment — with emphasis on accounting control — is now on Defense Secretary Wilson's desk. The plan proposes:

- More-centralized authority over machine-tool inventories in the Defense Dept.
- Continual review of inventories as related to mobilization needs.

As it stands now, it's uncertain just how the plan might affect future machine-tool buying by the military services.

The plan is outlined in a report by an eight-man task force made up of industry and Pentagon officials, who have studied military administration of industrial facilities for several months. Heading the team is Frank H Neely, Atlanta department store executive, whose unit is one of several groups working under the Cooper (Charles P Cooper, retired AT & T VP) committee, which recently investigated Defense Dept fiscal operations.

To some extent, the Neely Plan was prompted by a Vance Committee finding on production equipment two years ago: "The government owns about 20% of the total inventory of machine tools and other metalworking equipment. The management of this inventory obviously has a tremendous bearing on the financial condition of the production equipment industry and could affect the industry to the point of jeopardizing its existence."

The Vance Committee estimated that the military services own about 550,000 machine tools, replacement value $6 billion. But the Neely team reports that as of March 1, 1954, the services owned 218,889 tools, costing $2.1 billion.

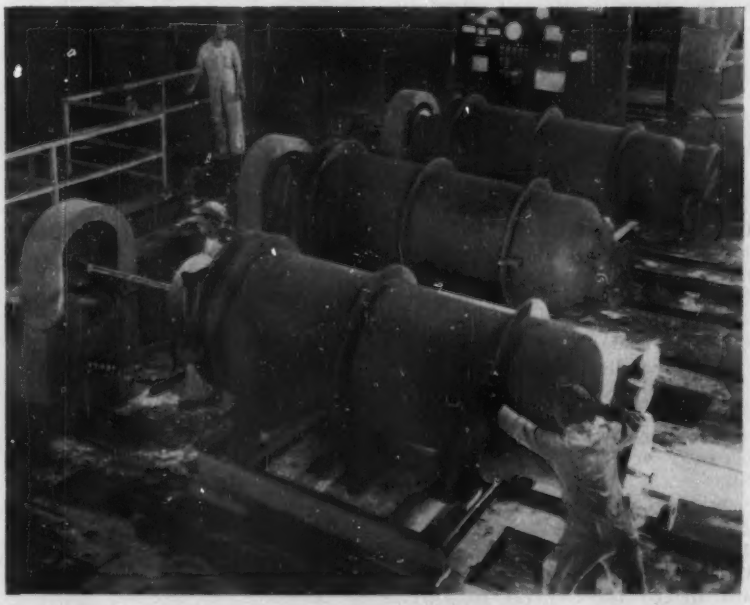
Neely's report concedes its figure and that of the Vance estimate aren't entirely comparable. Vance's included equipment owned by other US agencies (up to 10% of the total) and disregarded cost and location of the tools. Neely's figure is restricted to machines "on hand" in military inventories and worth at least $500 each.

Nevertheless, the Neely report implies, the disparity is large enough to be cited as an example of the unreliability of Pentagon record keeping on production equipment,

It's "Size Unlimited" in American

DUNKIRK, NY — Intricate metal shapes of almost any size can be plated with the chemical-nickel process at American Locomotive Co's plant here. The process, called Alcoplate, is an adaptation of the Kanigen process combined with new pre- and post-plating processes.

The Dunkirk plant handles the Alcoplate process by two continuous-flow methods: (1) a closed-cycle system for internal and volume coating of similar-sized products, and (2) an immersion process for both external and internal coating for plating product parts. Equipment includes giant cleaning vats; make-up, surge and regeneration tanks, heaters, pumps, and evaporators — all glass-lined and linked with glass piping (solution will deposit nickel on anything but glass surfaces.) Regardless of size, the process plates any size part in approximately the same amount of time (assuming same thickness of plating) at 0.6 to 1.0 mils per hour.



MOVING AN UNPLATED VESSEL INTO POSITION for closed-cycle chemical-nickel plating at ALCO's Dunkirk, NY, plant

Spoiling the Administrative Soup?

and to show the need for improvement in accounting and control procedures.

The Neely report makes three major recommendations:

• Management of machine tools (and military-owned industrial facilities in general) should be standardized among the three services as to terminology, pricing policy, and recording. Contractors' records for US-owned facilities should be used as official government accounting records. Individual services and the Defense Dept should develop a uniform way to compare current and mobilization requirements for production equipment using available tools. But there should be separate systems for facilities still in military production, and for those used in civilian production, and those still under construction.

• Authority over industrial facilities should be centralized. Purpose: to facilitate redistribution of equipment within and among services. A central production equipment control office should be set up in each service, under the direction of a staff agency within the Defense Secretary's office. (Today, management control over production equipment is split among the various branches.)

• Salaries and authority of property administrators should be increased.

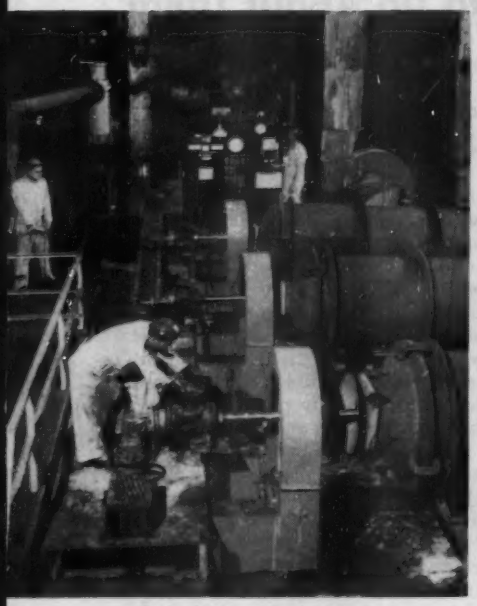
• The services should make continuing reviews for "proper management of production equipment," i.e.: (1) an analysis of centralized inventories to show surplus, obsolete and salvageable equipment, (2) surveys of total tool requirements for specific mobilization programs, (3) a special study of tools not used since Korea, to determine upkeep costs.

Van Norman-CIT Gear Tool Financing Plan to New Depreciation Rates

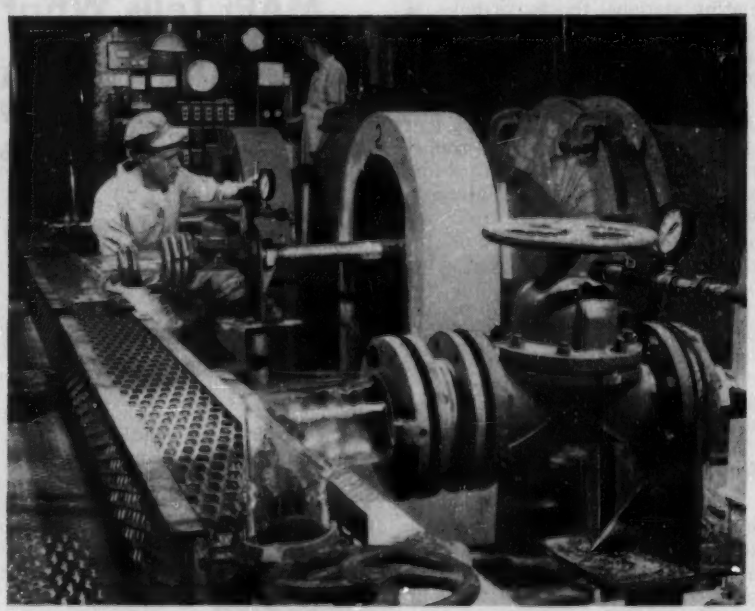
SPRINGFIELD, MASS—A five-way machine tool leasing plan, geared to the new fast-depreciation schedules, is announced here by the Van Norman Co, makers of milling machines, automotive reconditioning machinery; and radius, special production and centerless grinders. Van Norman's plan, according to President James Y Scott will be carried out with CIT Corp, industrial financing firm. Payments are made monthly.

Under terms of the plan, buyers can acquire Van Norman machinery in any of five ways: (1) straight cash purchase, (2) a lease plan running to 9 years, under which monthly rentals can be written off as expense, (3) a lease plan with option to buy, (4) an instalment plan with equal monthly payments and terms running to five years, (5) or a Pay-As-You-Depreciate (P-A-Y-D) plan with terms of up to 10 years and payments geared to match depreciation allowances under the new tax laws. Specifically, to the sum-of-the-digits method.

Locomotive's Electroless Nickel-Plating Setup



GLASS PIPING (foreground) links production components



WORKER ADJUSTS THE SOLUTION FLOW TO CONTROL PLATING RATE at the Dunkirk plating setup's No. 2 station. Again note glass piping (foreground)

"Pushbutton" Plating at Pontiac

UDYLITE-DESIGNED UNIT IS 480 FT LONG

DETROIT — How do you get a uniformly thick, bright plate on a cumbersome workpiece that has bad contours from the plater's standpoint?

That's the question Pontiac had to solve before it could authorize $3 million for an entirely new bumper-plating setup.

Designers of the 1955 car trim cared nothing for the fact that Pontiac only a few years ago put in an ultramodern, straight-through bumper-plating system. For sales-appeal reasons, the designers demanded a part with a cross-section like a flattened "C" and wrap-arounds almost 2 ft long — a piece that demands use of conforming anodes in still-tank plating to achieve a satisfactory job.

360 Bumpers per Hour

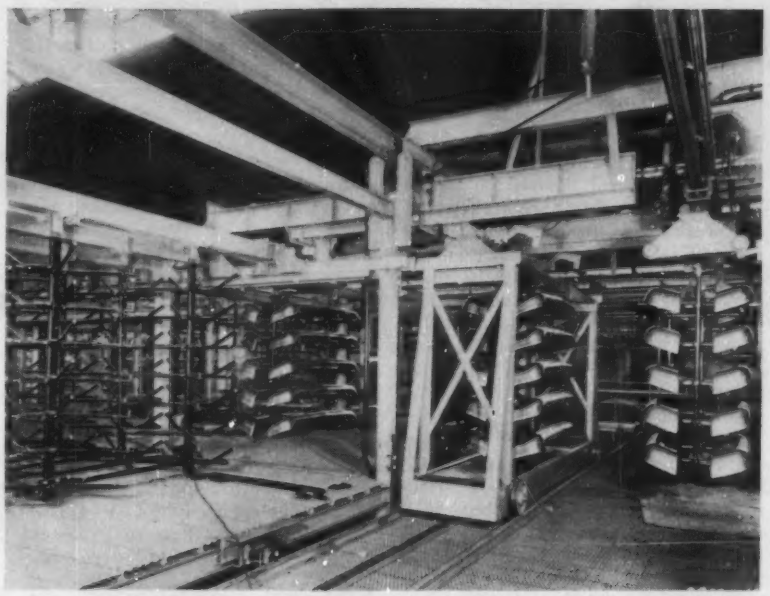
Udylite Corp engineers took on the task of developing a high-speed plating machine 480-ft long, in which still-tank plating is worked into an automatic setup — avoiding manual handling between tanks.

At the acid-copper and the nickel-plating stations, the tanks have 16 cells containing anodes that conform to the workpiece for proper distribution of plating metal.

When the machine is started up, the racks advance through various cleaning tanks. At the acid-copper tank, the mechanism puts a rack into each cell in turn at 2-min intervals. When all the cells are full, the mechanism goes back and pulls the rack out of Cell No 1, where it has been for the required 30 min, and traverses it directly to the drain and rinse stations. Cell No 1 then has a fresh rack of bumpers lowered into it. At the next "index," Cell No 2 is unloaded and replenished, and so on.

Good Drainage

The same method of loading and unloading 16 cells, is also used at the nickel-plating station. Bumpers are racked horizontally, so that the wrap-arounds cannot trap the solutions and sediments and increase drag-out loss.



RACK STORAGE AND LOADING STATION. Bumper shape demands still-tank plating, but to avoid layering the plate, racks cannot be lifted into and out of plating tanks at short intervals. Mechanism loads and unloads a series of plating cells, leaving individual racks undisturbed for 30 min

GOVERNMENT CONTRACTS:

MAPI Tells What to Do About Them

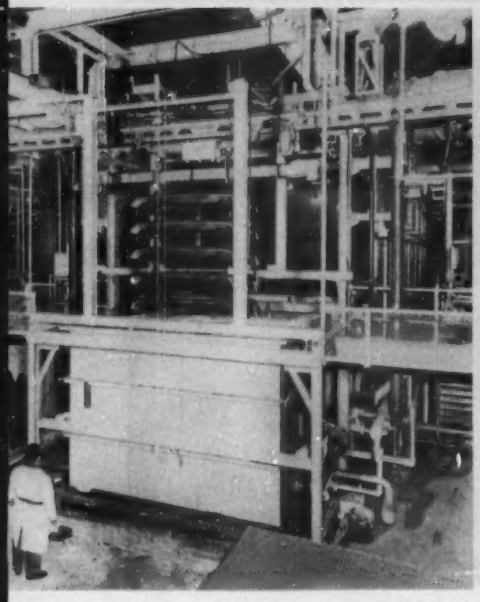
New booklet, based on experiences of MAPI member companies, urges basing of government contracts on producer efficiency, cost reduction and price advantages

CHICAGO — A complete overhaul of government procurement policy — based on the tenet of "the best possible product for the lowest price," is recommended in "The Government Contract," a 42-page booklet just published here by the Machinery & Allied Products Institute. The booklet makes seven basic recommendations:

- The government should establish a normal commercial contracting relationship where possible.
- Government procurement should be concerned primarily with price.
- Greater reliance should be placed upon use of contract incentives to cut costs.
- Government procurement policy should encourage participation of the most efficient producers possible.
- Reasonable limits should be placed on government control of the contractor's operations.
- Statutes and administrative regulations dealing with procurement should be reviewed and streamlined.
- Government procurement administration should be overhauled to define authority more clearly and promote uniform contract practice.

Detailed recommendations on scheduling, termination, design changes, management of tooling and facilities and many other facets of government contracting are included in "The Government Contract," obtainable at 50c from Machinery & Allied Products Institute, 120 S La Salle St, Chicago 3.

Saves Nickel, Improves Quality



SOAK TANK — first cleaning step in sequence that every hour produces 360 brightly finished bumpers that require no buffing

POWER SPRAY RINSE. Bumpers are racked in car position to drain properly and avoid excessive drag-out of solutions, and contamination of succeeding tanks. Plate is of uniform 0.0015-in. thickness. This avoids nickel loss from overplating edges, and poor-service quality from underplating broad surfaces

Norton Announces Four-Way Sales Plan

Under its comprehensive new setup, grinding machine firm will lease or rebuild, or will allow trade-ins and time payments on certain models and sizes of its machines

WORCESTER, MASS — Details of a new merchandising plan that covers the leasing, rebuilding, trading-in, and time payment arrangements on some of its standard grinding and lapping machinery will shortly be announced by the Norton Co.

Leasing

With regard to leasing, Norton is setting up an arrangement similar to that of Kearney & Trecker Corp, including that firm's plans A, B and C, covering these machines:

4 x 18″ Type CTU
6 x 18″ and 30″ Type CTU
10 x 18″ and 30″ Type LCTU
10 x 18, 36, 48, and 72″ Type CTU
14 x 18, 36, 48, and 72″ Type LCTU
6″ Angular Wheel Slide
10 x 18 or 36″ CV-4 Angular Wheel Slide
14 x 18 or 36″ CV-4 Angular Wheel Slide
Cam-O-Matic
6 x 18 and 8 x 24″ Surface
#20 Cutter and Tool
10 x 20″ Universal
12″ U-4 Universal
#16-FC Lapper
#26 Hyprolap

Other machines will be considered for special leasing as the occasion arises.

Rebuilding

Norton is also expanding its rebuilding operations and will rebuild certain types of standard grinders at a firm price of 45% of the price of a corresponding new machine with similar equipment. Other Norton machines will be rebuilt, but at individually determined prices. Norton will rebuild these on a 45% basis:

6″ Type C or CTU
10″ Type LC or LCTU
10″ Type C or CTU
14″ Type LC or LCTU
10″ Type C Angular
10″ Type CD
14″ Type C
16″ Type C
Type C Multipurpose

Trade Ins

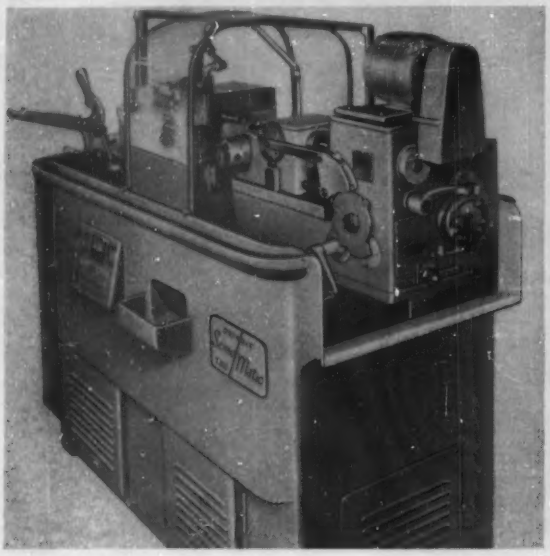
Regarding trade-ins, Norton believes the buyer gains a considerable advantage if the original equipment can be taken in trade, and is ready to consider trade-ins on a limited group of readily salable sizes:

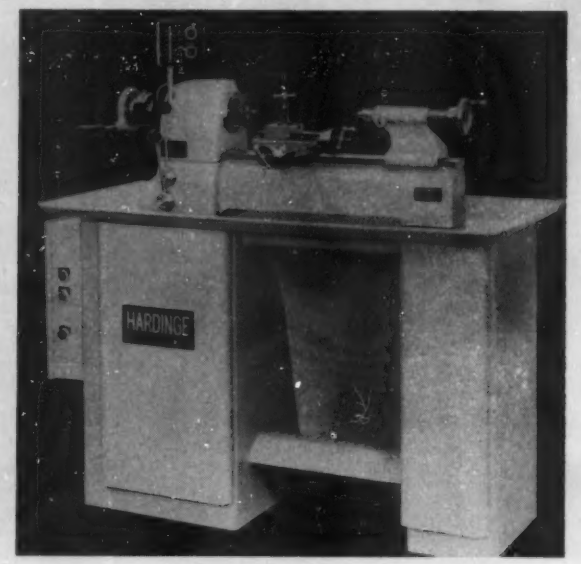
6 x 18 or 30″ Type C or CTU
10 x 18 or 30″ Type LC or LCTU
10 x 18 or 36″ Type C or CTU
14 x 18 or 36″ Type LC or LCTU
10 x 36″ Type C Angular
Type C Multipurpose

Time Payments

Norton's plans for time payments in purchasing of new machines are now being finalized. Arrangements will be handled through distributors and will be limited to those machines that are available for lease.

New Shop Equipment,





Automatic Screw Machine Has Variable-Speed Drive

Automatic single-spindle screw machine, Screwmatic 750, features an infinitely variable spindle speed drive permitting maximum speed of 5100 rpm. Drive permits choice of three spindle speeds during any work cycle. Reverse speeds are accomplished by air pressure. V-belt spindle drive is used in place of roller chains. An independently supported V-belt sheave drives spindle by means of clearance spline. The six-station turret is held in needle bearings and locked in hardened taper bushings.

Using standard size collets and feeders, Screwmatic 750 takes bar stock up to 0.750 in. Up to 2¼-in. stock lengths are turned with standard 7-in. cam. Turning lengths up to 6 in. are obtainable with larger cams. Turret slide proper is equipped with three position crank setting and turret index drive with three index speeds. They permit turret index strokes of 1/4, 1/3, 1/2 seconds.

Unit construction is an interesting design feature of the new machine. Simplified forms of the machine can be supplied for long-run production of simple parts.

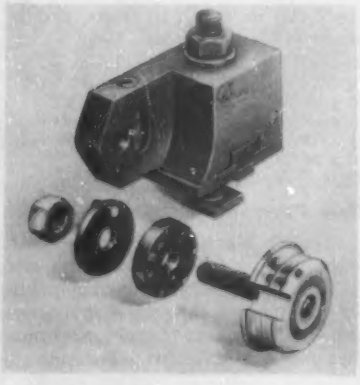
The Gear Grinding Machine Co, 3901 Christopher, Detroit 11, Mich

Variable-Speed Lathe Uses Pushbutton Control

Instantly variable spindle speeds are achieved by pushbutton control on Hardinge DV59 high speed precision lathe. Power operated from a control box located over the headstock, changes in spindle speed are accomplished by pressing faster or slower button until desired speed is reached. Indicator with range of 230 to 3500 rpm shows exact speed at all times.

Also featured on the new lathe is a ball-bearing, lever-operated collet closer. Operators can open or close collet or step-chuck while machine is running or stopped. Machine has 1 1/16-in. collet capacity.

Hardinge Brothers, Inc, Elmira, NY



Cross-Slide Toolpost Has Screw Adjustment

Adaptable cross-slide toolpost reportedly enables user to employ smaller circular form tools on larger automatic screw machines. Special screw adjustment provides positive and accurate setting of cutting edge. Provision is also made for squaring the tool with the work.

The Adaptool-post is provided for either front or rear. Both styles are made of hardened and precision ground steel alloy.

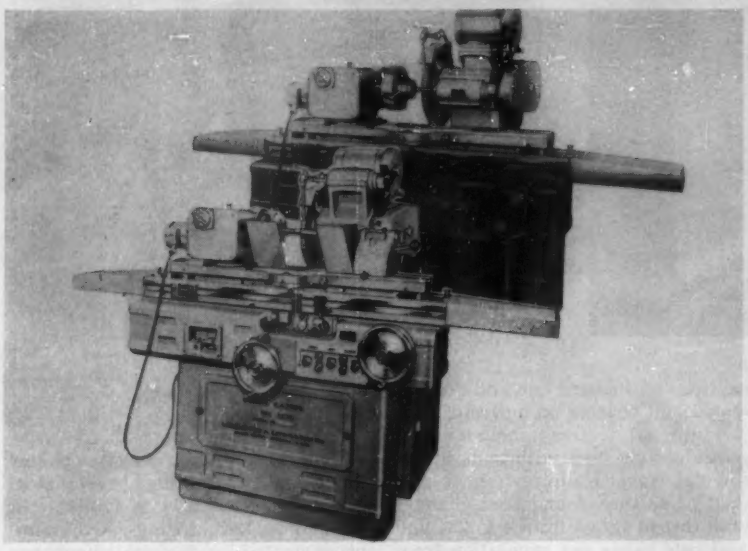
American Cam Co, Hartford 1, Conn

Machine-Tool Transformers

A new line of machine-tool transformers offering 100 combinations of ratings and accessories has been announced. In 16 designs, new control transformers save panel space and reduce wiring cost by incorporating accessory connections directly into basic unit. Line includes 8 v-amp ratings with which there are 100 combinations of frequency, voltage, physical arrangement of terminals, cable leads, and circuit protection.

General Electric Co, Schenectady 5

Materials and Parts . . .



Cylindrical and Internal Grinder Incorporates Hydraulic Table

Built specifically for cylindrical and internal grinding, No. 1230 is said to be capable of making rough cuts as well as producing the finest finish. The machine uses cabinet base design and has its worktable mounted directly on fixed base ways, without an intervening cross-traveling saddle.

The table can be hydraulically operated at speeds from 3 to 50 ipm. A closed-circuit exhaust-control hydraulic circuit is used, embodying special features which provide uniform motion at slow speeds. The hydraulic controls are grouped directly above the electrical panel. The table can be operated by hand by means of the two-speed handwheel on the front of the base.

The machine table is mounted on a circular turntable graduated in degrees and a taper per foot scale is mounted at the end of the table. The wheelfeed handwheel is at the front of the base and includes micrometer crossfeed mechanism for fine wheel feed.

The wheelhead is mounted on a large graduated column on the cross-sliding saddle. Machine is equipped with extra-heavy-duty, precision-ball-bearing, quill-type spindle. Spindle drive motor is mounted directly on grinding wheelhead for motor and belt-tension accessibility. Two speeds are provided to allow use of worn wheels.

The workhead unit has a built-in device providing variable speeds from 0 to 400 rpm with live or dead-center drive. The rugged tailstock is provided with lever-operated, adjustable-spring pressure center and center lock. The steadyrest will handle a maximum of 3-in.-dia work. An 8-in. four-jaw independent chuck is standard equipment, with 6-in. face plate available at extra cost. A table-mounted wheel dresser will dress cylindrical wheel at work center height. The standard internal grinder quill is the ⅝ series operating at 24,000 rpm to take wheels to 1-in. dia.

Work between 8 and 12-in. OD can be ground without disturbing external wheel. (Also work with small hole up to 8-in. OD). The cylindrical grinding wheel has 14-in. dia, is 1-in. thick with 5-in. hole and operates at 6500 sfpm.

Gallmeyer & Livingston, 346 Straight Avenue, Grand Rapids, Mich

. . . including

Cabinet-model lathe has patented back-gear shift lever to change from direct to back-gear spindle drive . . . page 140

Engine lathe tests show 125-hp motor yielding 118 hp consumed at the cut . . . page 141

Roll grinder traverses wheel across face of rolls weighing 25,000 lb . . . . . page 142

Injection molding machine plasticizes 80 lb of styrene per hour . . . . . page 144

Spray control valve operates automatically in conjunction with centralized lubrication systems . . . . . page 145

Surface broaching machine, vertical, hydraulic, has 90-in. stroke and 15-ton capacity page 148

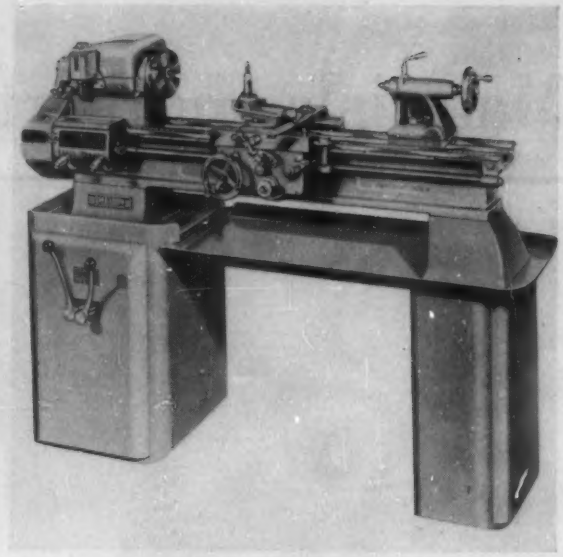
Roll polishing machines have electro-hydraulic controls for patented contour device page 152

Optical profile grinder is hydraulically controlled page 156

. . . and in Jan 3

Centerless grinder line redesigned for greater convenience, quicker setup, and closer accuracy limits.

Helical gear hobber hydraulically controls automatic feed along helix angle.



Delta Cabinet-Model Lathe Has Variable Speed Drive

Delta has introduced an 11-in. cabinet-model variable-speed-drive lathe with a 24-in. capacity, center to center, and 1-in. collet capacity.

Outstanding feature is reported to be patented back gear shift lever, located on front of machine, which eliminates need for using wrenches, pull-out pins, or opening guards to shift from direct spindle drive to back gear spindle drive, loose or locked spindle. In addition, varispeed drive offers range of 44 to 1550 rpm with infinite choice. Spindle is carried on two tapered roller bearings on inboard end and floating sealed ball bearing on outboard end.

Additional features include: precision ground bed with separate V and flat ways; leadscrew shear pin; total of 48 thread and feed changes with thread range from 4 to 224 and feed rate range per revolution from 0.0902 to 0.0016 in. longitudinal and 0.0301 to .0005 in. cross.

A full line of accessories is available including a durable taper-turning attachment as well as micrometer stops, milling attachments, and standard type of collet chuck.

Delta Power Tool Div, Rockwell Manufacturing Co, 438 N Lexington Ave, Pittsburgh 8, Pa

New Sheldon Lathes Feature Pedestal Design

Cast-iron pedestal encloses motor and drive; tailstock leg provides storage space. New lathe is available in 10, 11 and 13-in. swings. Other improvements include double neoprene cog V-belts; new safety switch; special formica end gears; and zero-precision tapered roller bearings supporting the spindle.

Quick-change gearbox has 54 pitches and rapid selection of pitches and feeds can be made while lathe is running.

Sheldon Machine Co, Inc, 4258 N Knox Ave, Chicago 41, Ill

Keyhole Drift Slot For Spindle Machines

Slot design consists of round top portion which serves as bushing for key and rectangular slot to permit use of conventional drifts. Cam-shaped tip of ejector rotates against top of tang, pushing tool from spindle. There are no axial stresses or shocking hammer blows.

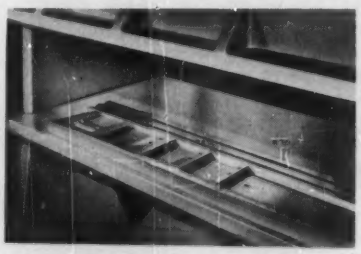
The Keyhole tool ejection method is presently being used for changing tools in standard Scully-Jones adjustable adapters, precision sleeves, and sockets, etc. Ejectors are available for Nos. 1 to 5 MT. Additional information is in Bulletin 14-50.

Scully-Jones and Co, 1901 S Rockwell St, Chicago, Ill

Clarkson Spiral Side And Face Cutters

Spiral side and face cutters are made from 18% tungsten HSS and the special tooth lip maintains cutting angle after frequent regrinding. It is reported that maximum speeds and feeds can be used.

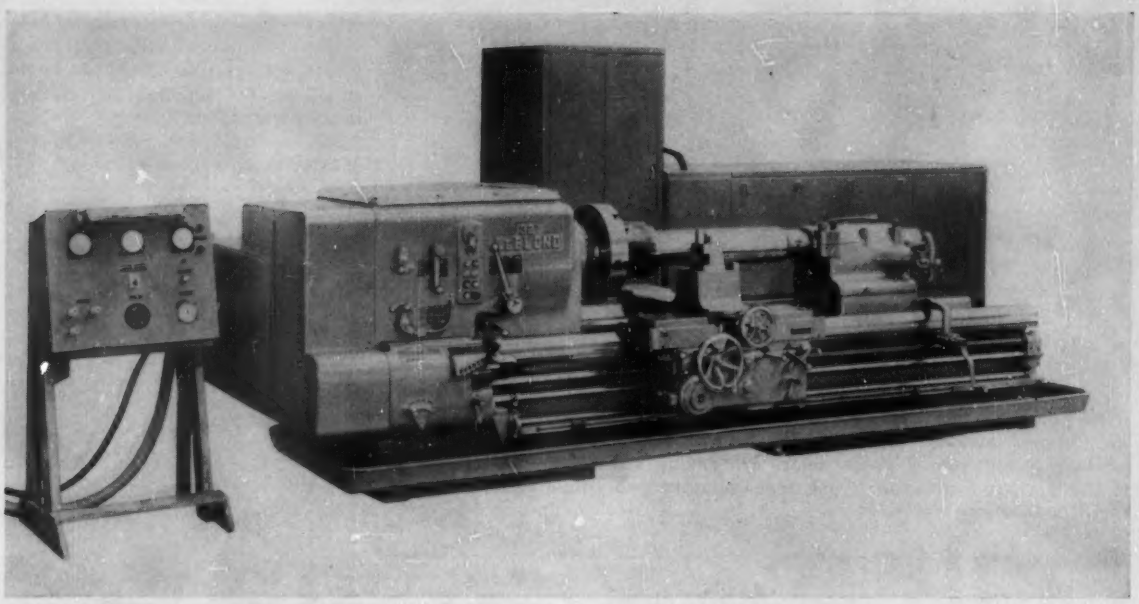
Clarkson, Inc, 4004 E 8 Mile Rd, Detroit 34, Mich



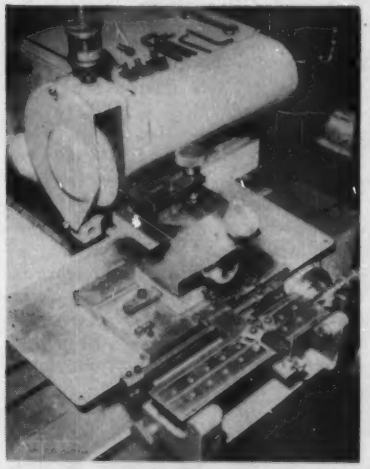
Bed Rail Adapters

Used with Wales press brake bed rails for fast, accurate mounting to layout pattern of independent, self-contained hole punching and notching units. Spring-check steel balls provide tension to hold units in bed rail. Adapters located for straight-line or staggered hole punching patterns.

Wales-Strippit Corp, 345 Payne Ave, N Tonawanda, NY



HEAVY-DUTY ENGINE LATHE, 32-in. swing, equipped with 125-hp motor, has had tests showing 118 hp consumed at the cut. Specifications include: infinitely-variable speeds from 42 to 1400 rpm; 56 feeds from 0.002 to 0.250 ipr. Standard features include 4-directional power rapid traverse built into apron; one-piece apron and hardened rack; totally-enclosed quick-change box; hardened and ground steel bed ways; thrust-lock tailstock. Test was made on SAE 1045 at 205 sfpm — *R K LeBlond Machine Tool Co, Cincinnati 8, Ohio*



Tool Grinder and Attachments

Redco tool grinder equipped with attachments for carbide-tipped and HSS tools has been announced. The profiler, yoke, and profile single tool attachments make the grinder effective in re-sharpening standard production tools and making and re-sharpening many special cutters. Profile attachment with templet and guide enables maintenance of tolerances as close as 0.0002 on cutting edge.

Redco Tool Division, Red Lion Cabinet Co, Red Lion, Pa

Induction Heating Products

Ther-monic 25-kw induction heating generator is a redesigned unit using latest in heavy wall anode oscillator tubes and specially designed high current tank circuits. Generator is totally enclosed. An internal cooling system recirculates air while providing positive pressurization.

Ther-monic vertical progressive hardening machine is an automatic unit capable of induction hardening shafts 3 to 45 in. in length and up to 6-in. diameter. It may be used with any Ther-monic electronic generator from 5 to 50kw or with motor generators to 250kw.

Induction Heating Corp, 181 Wythe Ave, Brooklyn 11, NY

Soldering Gun

Lightweight soldering guns have no moving parts and no heavy transformers. All have steel clad tips and feature current "thermostatic brain." Pull the trigger and in seconds current heats to exact required temperature and brain automatically regulates wattage from maximum to minimum.

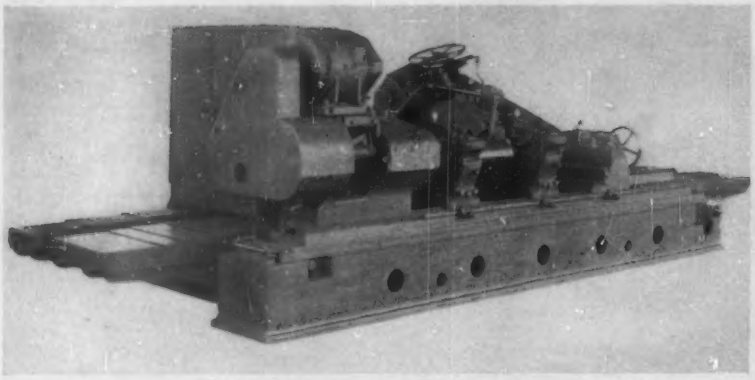
Models 212LT and 214LTN have interchangeable tips and element assemblies. This provides wattage power range from 150 minimum to 650 max. Guns operate from either ac or dc and are U L approved.

Garden City Industries, Inc, 900 W Jackson Blvd, Chicago 7, Ill

Stair Cart Uses Power Rachet Drive

Two-wheel hand truck is equipped with power ratchet drive which advances it upward from step to step as operator pulls drive cable. Two-wheel brakes allow safe control for 500-lb loads.

Valley Craft Products, Inc, Div O'Neil-Irwin Mfg Co, Lake City, Minn



ROLL GRINDER traverses wheel across face of rolls weighing up to 25,000 lb. Lengths between centers range from 120 to 240 in. The 36-in.-dia wheel is driven from a 40-hp motor. Wheelhead traverse is variable from 2 to 100 ipm. Work speeds of V-belt-driven headstock vary from 12 to 100 rpm—*Landis Tool Company, Waynesboro, Pa*

either visual or photographic use.

Measures irregularities of 1 mu-in where surface rate of change is too small to be detected by electro-mechanical means.

Farrand Optical Co, Bronx Blvd & E 238th St, New York 70

Automated Broaching

Automating broaching setup broaches splines in two different models of a differential side gear at total rate of 800 per hr. Gears are fed to four side-by-side broaching stations by a continuous chain loading conveyor carrying 144 individual workholding fixtures. A cycle requires 18 sec. Small cams on the backs of the fixtures actuate the limit switches.

No clamping fixtures are required. Stationary hold-down bars above broaching station keep each gear seated in its fixture as broach is drawn through hole. Conveyor is indexed hydraulically.

Colonial Broach Co, P O Box 37, Harper Sta, Detroit 13, Mich

Offset Boring Head

No. 820 offset boring head is adapted to a variety of applications through use of interchangeable shanks. Symmetrical design with minimum overhang of slide bar reportedly results in greater accuracy and longer life. Micrometer adjusting collar is arranged so one revolution moves tool-holding slide bar 0.050 in. radially.

Maximum offset capacity with standard slide bar is ¾ in. All slide bars accommodate ⅜-in.-diameter tool shanks.

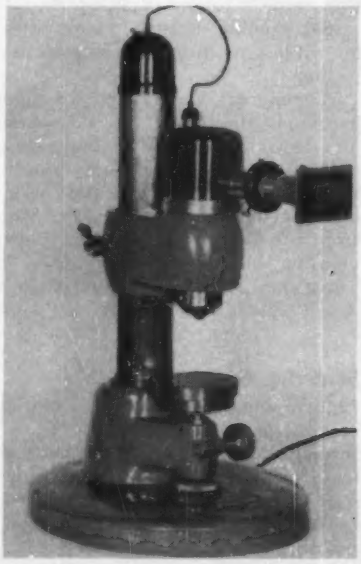
Micro Instrument Co, 80 Trowbridge St, Cambridge 38, Mass

Sibley Drilling Machine Handles Large Work

Model E-25 drilling machine has 22x 30-in. table and pedestal jack to support table and permit lowering and raising it. Other features include: capacity of 1 in. in cast iron; swing of 25 in.; full-floating ball bearing spindle with travel of 8 in.; 4½-in.-dia solid column; table accuracy maintained to 0.0007 in. in 6-in. radius; and variable drive from which spindle speed may be obtained for any size drill from ⅛ to 1 in.

Range of spindle speeds is obtained by self-locking control—there are no belts to change. Five options of spindle speeds, each with a 4 to 1 ratio, are available, ranging from a low of 206 - 825 to a high of 540 - 2160 rpm.

Sibley Machine & Foundry Corp, South Bend, Ind



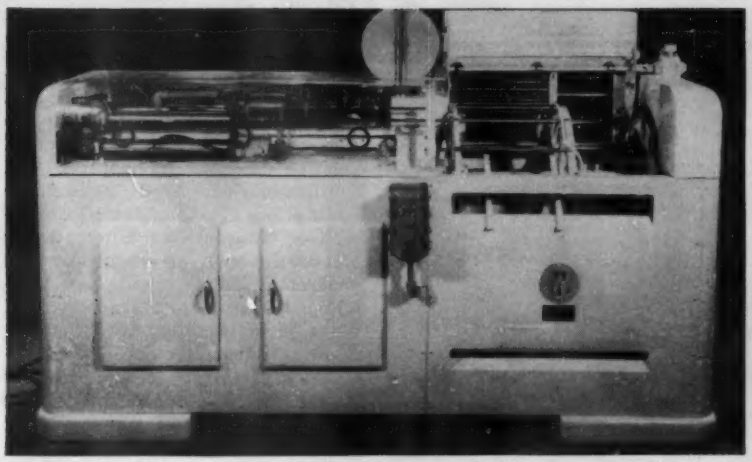
Interference Microscope

Model B optical instrument measures surface roughness and finish of any of various materials, is adaptable for

Hand Tapping Fixture

Fixture consists of a 24x34-in. T-slot bed on bench-high cast floor legs with heavy jointed swinging arm which takes interchangeable tap holders and rotates on a rigid column. Tap holders have centered female sockets to receive standard taps in one end and slide vertically through a wide hub in the free end of the swinging arm. The other end of the tap holders are keyed to take a T handle for driving the tap.

Tools, Inc, 1733 N 25th Ave, Melrose Park, Ill

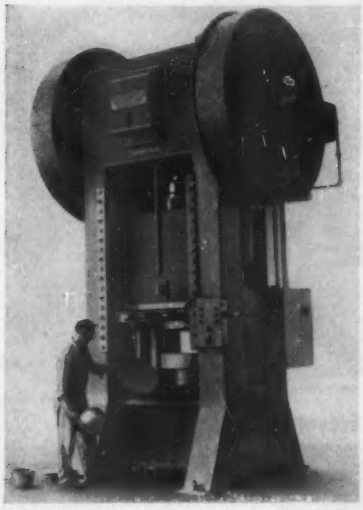


Artillery Tubes Handled By Special Machine

Automatic machine lacquers the interior of the primer body, punches from a roll of paper, and forms and installs diaphragms, seats diaphragms to required depth, inspects for presence of and proper depth of diaphragm, and ejects finished piece.

Machine is of steel fabricated construction with removable sides and lucite cover over the cylinders. An interlocking electro-pneumatic circuit operates Bellows air motors and rotary index table, controlled by microswitches. Primer bodies are hopper fed into the machine which will accommodate bodies from 3 to 24 in. in length at a speed of from 20 to 50 pieces per min.

Walsh, Inc, 646 North Michigan Ave, Chicago 11



Deep-Draw Presses

Steelweld Hi-Draw presses, for high-production deep-draw work, are designed to operate at high speeds through non-productive portion of ram stroke and at correct drawing speed during working part of stroke. This is accomplished through a newly developed linkage.

Press operating speeds can be up to 80% greater in spm than equivalent crank press with same stroke, it is reported. Sizes range from 160 tons capacity and up in one-, two-, and four-point types.

Steelweld Machinery Div, The Cleveland Crane & Engineering Co, Wickliffe, Ohio

Whiteprinting Machine

The Challenger, with automatic tracer separation, is a one-step feed machine. With printer and developer synchronized to a maximum of 40 fpm, an 8½x11-in. tracing is returned to the operator in 2½ sec after feeding, and a finished Whiteprint delivered in 6½ sec.

The C F Pease Co, 3991 N Rockwell St, Chicago 18

Double-End Snagging Grinder Has Infinitely Variable Speed

Model 10GVS double-end infinitely variable-speed snagging grinder accommodates two 20-in. dia by 3-in. face grinding wheels. The design for vitrified bond wheels will maintain 6500 sfpm; for resinoid bond wheels, 9500 sfpm.

The 10-hp motor on rear of base moves in dovetailed slide which has adjusting gib for rigidity. Equipment includes magnetic starter with separate start-stop pushbutton station. The 4x9-in. adjustable work rest at each wheel is supported by base.

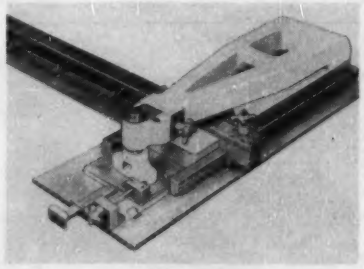
Standard Electrical Tool Co, 2480 West Sixth St, Cincinnati 4, Ohio

Federal Air Gages for Refrigerator Compressor Parts

Model H-159 makes critical concentricity and squareness checks on various sizes of cylinder housings. It consists of a dial indicator gaging unit and a 5000:1 Dimensionair.

Model H-160, a multi-station Dimensionair gage, checks eleven dimensions on crankshafts. It is equipped with six fixed, jetted, air snaps which measure the diameters of bearing journals and cams. To facilitate handling the crankshafts, two sets of V's are used.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

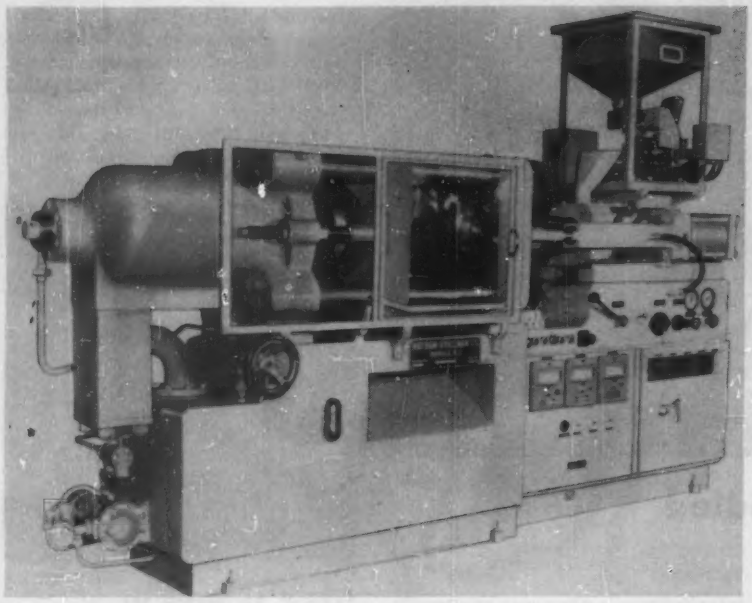


Punching Unit

Quickset unit, designed for low-run production, is a single-hole piercing tool which pierces from 3/32 to 2-⅛-in. dia in up to ⅛-in.-thick mild steel. Interchangeable punch heads and die units can be changed on the frame.

Unit has 24- in. throat depth and is furnished with 36-in. combination back gage and end stop bar. These slide along pair of rails with holes at 1-in. intervals.

Toolset Div, General Riveters, Inc, 777 Hertel Ave, Buffalo, NY



Injection Molding Machine Plasticizes Styrene at High Rate

Automatic hydraulic injection molding machine with 5-oz capacity will plasticize 80 lb of styrene per hour. It is equipped with internally heated torpedo featuring 3-zone heat control for better plasticizing at lower temperatures. Long stroke, large die space, and low pressure closing are featured.

Machine has straight hydraulic clamp design and full clamping pressure can be exerted at any point in stroke requiring no adjustments for molds of varying thicknesses. Controls are located in front of machine and front and rear safety gages protect operator. Pumping unit consists of 2 vane pumps delivering 17.7 and 2.5 gpm directly connected to 25-hp 1200-rpm motor. Machine is normally equipped with self-compensating hopper with feed slide.

Watson-Stillman Co, Div H K Porter Co, 200 Aldene Rd, Roselle, NJ

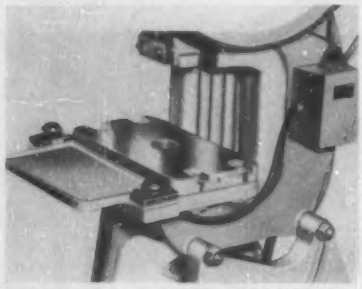
Autocarb Furnace

A new gas carburizing and cyaniding furnace and atmosphere generator has been developed by Sunbeam. The package unit, with pushbutton operation, automatic cycling, positive temperature control, and continuously assured atmosphere quality, has carbon potential of protective atmosphere automatically and continuously maintained by new generator design. Among the automatic features is the removal of work from the high-heat chamber into the quench. A one-piece high-temperature-alloy screw conveyor moves the work onto the quench elevator platform.

For maximum temperature uniformity to control the depth of case, the furnace has special heat diffusion baffle walls between radiant heating tube and work. A high-temperature-alloy radial-wheel fan mounted on top of furnace circulates air up through work and down past heading tubes.

This package can be used for gas carburizing, carbonitriding, clean hardening, and carbon restoration, as well as martempering, marquenching in hot oil, and controlled atmosphere annealing and normalizing.

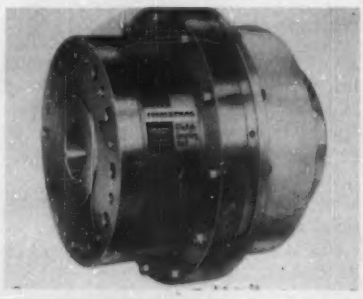
Sunbeam Corp, 4433 W Ogden Ave, Chicago 23



Solenoid Control For Punch Presses

Two-hand electro-solenoid control requires that the operator push two mushroom-type buttons in order to trip the press. More pushbuttons can be added for installations where more than one operator is at the press. A foot control can be plugged in when necessary.

Searjeant Metal Products Inc, 77 Pittsford Rd, Mendon, NY

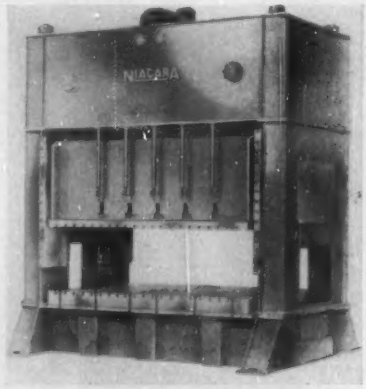


Clutch Coupling Unit

Clutch coupling unit is for applications where over-running features are required in conjunction with a flexible coupling.

Two constructions are available within same space limitations. One is for low-speed over-running; the other, where continuous high-speed over-running conditions are encountered.

Formsprag Co, 23601 Hoover Rd, Van Dyke, Mich



Eccentric-Geared Presses

Designed to handle variety of large, heavy tonnage drawing, punching, and blanking work, line of straight-side eccentric-geared presses covers range of 100 through 1000-tons.

Crankless eccentric drive is said to deliver greater torque with less deflection than possible with other types of construction. Frames are all-steel, four-piece, tierods. The pneumatic friction clutch is designed so most of weight of clutch continues to rotate with flywheel.

Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY

FYI

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MACHINES AND ATTACHMENTS

1 FLUXLESS SOLDERING — *Aeroprojects Inc, West Chester, Pa.* 10-page Sonobond brochure shows new applications of ultrasonic soldering and metal coating and several equipment models.

2 SQUARING SHEARS — *Columbia Div, Lodge & Shipley Co, Hamilton, Ohio.* 52-page folder of literature covers models with capacities from 3/16 to 3/4 in. thicknesses in mild steel, and accessories available. Also covered are power press brakes in capacities from 14 ft x 10 gage to 6 ft x 5/16 in. up to 12 ft x ½ in. to 10 ft x ⅝ in. A final folder gives features of hydraulic compression molding presses.

3 THREAD - ROLLING ATTACHMENT—*Landis Machine Co, Waynesboro, Pa.* 12-page bulletin G-96-2 details five Lanroll attachment sizes for use on screw machines and lathes to produce anything from coarse to class-4 threads.

4 HAND BRAKES—*O'Neil-Irwin Mfg Co, Lake City, Minn.* 16-page Di-Acro brake manual shows how brakes can be converted into bar folders, radius formers, open-end brakes, standard, or box-and-pan brakes by changing top forming bar. Ten brake models are shown with capacities and specifications.

5 ABRASIVE CLEANERS—*American Wheelabrator & Equipment Corp, Mishawaka, Ind.* Bulletin 744-2 gives case history of heavy-casting cleaning with 63-ft Tumblast unit, showing how daily man-hour requirements were cut 80% on typical job.

6 TURNTABLES & CONTROLS—*Etzler Engineering Co, Newark 3, NJ.* Catalog 88-55 describes indexing turntables for rates from 1 to 400 rpm and variable speed controls.

7 ELECTRONIC CONTROLS—*W F & John Barnes Co, Rockford, Ill.* 8-page booklet on "Electro-Graphic Detector Systems" describes development for simplifying maintenance of machine controls for automatic equipment of many types.

8 HYDRAULIC CYLINDERS—*Vickers Inc, Detroit 32.* 8-page catalog describes "Compact" line of cylinders for pressures of 2000 psi, showing five mounting methods and giving specifications.

TOOLS AND ACCESSORIES

9 CARBIDE HEADING DIES—*Champion Tool & Die Co, McKeesport, Pa.* Brochure covers new sectional heading die with inserts and recessed head caps that are replaceable for making different-size screws.

10 WAX CUTTING FLUIDS—*S C Johnson & Son, Inc, Racine, Wis.* 16-page booklet describes water and oil type wax coolants and cutting fluids for cutting and grinding operations.

11 GRINDING WHEELS — *Robertson Mfg Co, Trenton 8, NJ.* Two 4-page bulletins cover grinding wheels and wheel segments, showing advantages and fine points.

12 HARDNESS TESTER—*Torsion Balance Co, Clifton, NJ.* 4-page bulletin describes Rockwell hardness tester for regular and superficial examinations, and illustrates features.

13 COMPARATOR — *Portman Instrument Co, New Rochelle, NY.* 4-page catalog shows many setups of "Target" duplex shadowgraph comparator, featuring economy and speed.

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Company .....
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FYI
FOR YOUR INFORMATION

14 GEAR HOBS—*Star Cutter Co, Farmington, Mich.* 8-page color bulletin gives tolerances of single- and multiple-thread hobs, including runout, lead, tooth, and sharpening dimensions. Milling-cutter line is also illustrated.

15 LUBE SYSTEM—*C A Norgren Co, Englewood, Colo.* 8-page brochure shows principles and advantages of spray-lube, oil-fog systems for machines.

HEAT-TREATING AND WELDING

16 SPOTWELDER—*Sciaky Bros, Inc, Chicago 38.* 8-page bulletin introduces SPT 2 and EPT 2 air-operated press-type 3-phase projection and spotwelders, and shows general construction, features, and operation.

17 ELECTRODES—*Metal & Thermit Corp, New York 17.* Literature on Murex arc-welding electrodes and rods and wire for gas, submerged-arc, and inert-arc welding includes 7 bulletins organized by material to be welded—stainless, mild steel, aluminum, etc.

18 WELDING DESIGN—*Lincoln Electric Co, Cleveland 17.* Three articles from "Welding Engineer" in reprint form cover weld costs, calculating loads, use of best materials—title is "Practical Design for Welding."

19 TEMPERATURE CONTROLS—*Minneapolis-Honeywell Regulator Co, Philadelphia 44.* Bulletin HT-1 is a 16-page treatise on automatic temperature control for induction-heating equipment, touching on equipment, theory, and safety. Bulletin includes photos and diagrams.

20 GAS EQUIPMENT—*C M Kemp Mfg Co, Baltimore 2, Md.* 20-page case-history booklet shows installations of immersion heaters, dryers, and inert-gas generators at 17 companies.

PLANT SERVICE EQUIPMENT

21 TRANSFER MACHINES—*Ferguson Machine & Tool Co, St Louis 21, Mo.* 4-page pamphlet illustrates standard multiple-station transfer machine for straight-line operations where user supplies his own tools. One type for speed, and another for versatility, are available.

22 CONVEYOR SYSTEMS—*American Cable-Link Co, Detroit 27.* 6-page folder shows construction and examples of installations of cable-link conveyors.

23 WORK BENCHES—*Alden Systems Co, Westboro, Mass.* 20-page booklet shows how to get "More Dollars from Less Space" with work centers and special installations.

24 LIGHTING—*Sylvania Electric Products Co, Wheeling, W Va.* 20-page booklet covers layout, light distribution, and fundamentals of lighting for improving office conditions.

25 AIR CONDITIONING—*Westinghouse Electric Corp, Sturtevant Div, Hyde Park, Boston 36.* 48-page catalog 1630 gives descriptive, application, performance, layout, and service data for air conditioners for plant installation. Included are fan-performance tables, temperature charts, and cabinet dimensions.

26 ALUMINUM FINISH — *American Chemical Paint Co, Ambler, Pa.* 4-page bulletin covers uses and advantages of Alodine 1000 for outdoor aluminum, used as pretreatment for paint or lacquer, or as final coat.

27 CHROMATE FINISHING — *Allied Research Products, Inc, Baltimore 5, Md.* 8 data sheets describe Iridite chromate conversion coatings as corrosion-preventing paint bases. Data is classified by general information, metals covered, and finishing processes.

PARTS AND MATERIALS

28 DIE CASTINGS—*Page & Hall Mfg Co, Boston 36.* 4-page pamphlet, "Intricate Small Die Castings," show parts produced with average tooling costs of $530, with lowest cost $165, and highest $1375. Casting service is available for short runs.

29 STEEL OILITE — *Amplex Div, Chrysler Corp, Detroit 31.* 4-page folder announces steel Oilite, a sintered powdered steel claimed to have 10% or more ductility and high impact and fatigue strength. Strength is rated in the range of low-carbon steel.

30 GEARS—*Precision Instrument Co, Lynbrook, NY.* 64-page pocket-size book covers precision gears, shafts, collars, couplings, and other small components for standardization program. Data includes dimensions and tolerances.

31 RUBBER—*General Tire & Rubber Co, Wabash, Ind.* 8-page pamphlet is buying guide for molded and extruded rubber and plastic parts, giving chemical and physical properties of raw stock and showing examples of molded products.

Air Presses Have Range of Capacity

Air presses, ranging from ¾ to 2 tons, feature: 5-in. side-thrust bearing, heavy-walled brass cylinder, removable base with large ground surface area, and press body of two-piece construction. Optional feature is series of self-aligning sub-presses which, when used with Paragon air press, permit instant setups and set-up changes. The press comes in 4 models with cylinders of 4- to 7-in. bores.

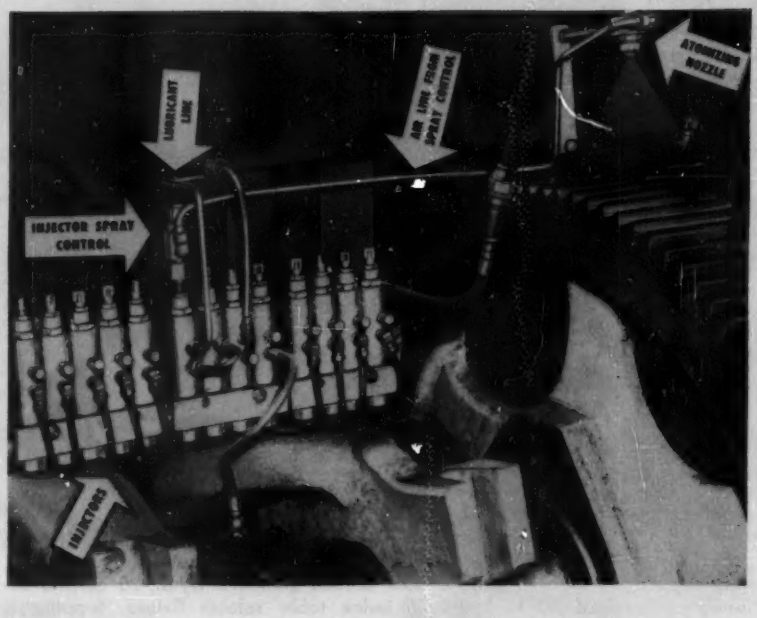
The following specifications are the same for the three larger models: stroke 3 in.; ¾-in. ram; 6½-in. depth of throat; and 9-in. table-to-ram.

Price Machine Products, 929 W 80th St, Los Angeles 44, Calif

Ultrasonic Equipment For Fluxless Soldering

Sonobond will tin aluminum, copper, magnesium, and silver without use of flux. Equipment is being built with sufficient electronic power to tin on a production basis. It is reported simple to operate. The company's pilot plant has several variations of the standard Sonobond as well as prototype equipment such as a flat soldering head and small hand-operated units. All of these are available on a contract basis at Aeroprojects plant.

Aeroprojects Inc, West Chester, Pa

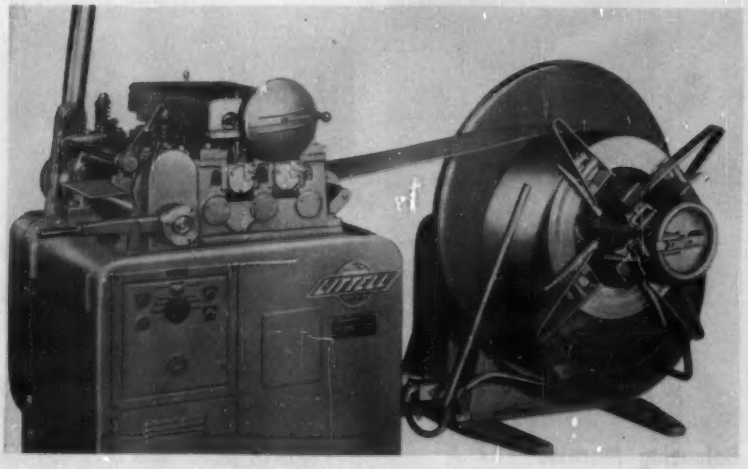


Automatic Mist Lubricator Has Spray Control Valve

Spray control valve operates automatically in conjunction with centralized lubrication systems to provide controlled mist lubrication for open gears. Valve may be assembled to any lubricant injector in centralized system, mounted either adjacent to or remote from gears to be lubricated. As injector begins to discharge lubricant, movement of injector indicator stem permits spray control valve to open, allowing regulated air to pass spray nozzle.

Lubricant can be increased as desired by diverting it from two or more injectors through lubricant line to adjustable spray nozzle.

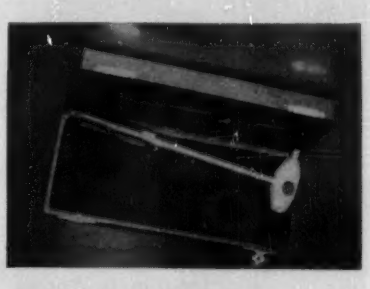
Lincoln Engineering Co, Industrial Division, 5703-27 Natural Bridge Ave, St Louis 20, Mo



Straightening Machine Converts Press

Hydraulically driven feeding and straightening machine converts manually operated punch press to automatic operation. Model 418-HRP will handle stock to 0.125-in. thickness. Line includes three sizes.

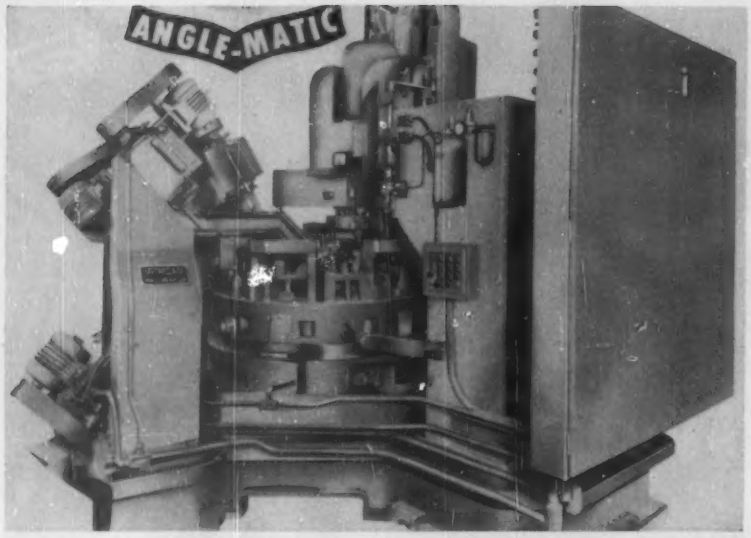
F J Littell Machine Co, 4127 N Ravenswood Ave, Chicago 13



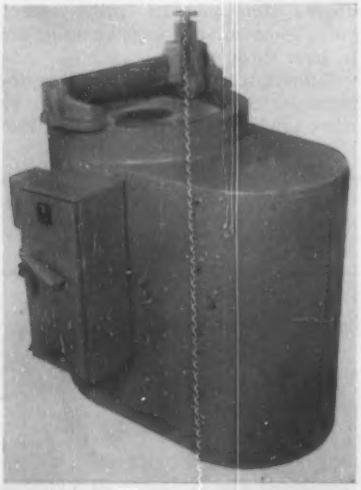
McGlynn Hays Internal Measuring Instrument

The Opti-Mike operates on the two-point measuring principle. Use of the instrument does not depend on feel. The head is inserted into a bore at a slight angle and, by making a sweep of a few degrees, a measurement is taken and read directly to 0.00025 in. A range of 0.8 to 6 in. is covered.

McGlynn Hays Industries, Inc, Belleville 9, NJ



WATER - PUMP BODIES for V-8 engines are drilled, chamfered, spotfaced, and tapped on special machine built around standard Hydro-20 column assembly. Standard 60-in. hydraulic index table rotates fixture; tapping is done by Michigan units with individual leadscrews. Production rate is 120 per hr — *Michigan Drill Head Co, Detroit 34, Mich*



Disk Grinder

No. 188-18-in. horizontal disk grinder does freehand grinding of a single flat surface on small parts. The vertical spindle is mounted in antifriction bearings and driven through multiple V-belts from 5-hp motor. A hand-operated bar dresser is provided.

Gardner Machine Co, Beloit, Wis

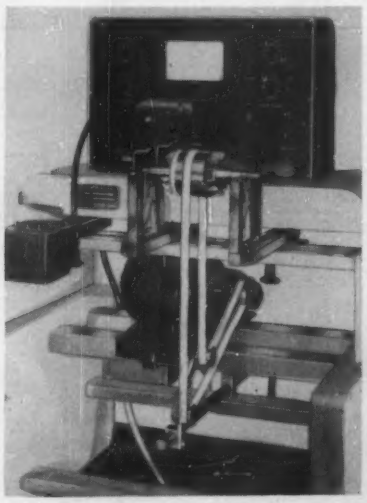
Gas-Cutting Torch

Torch line features hard-drawn, pure-copper cutting tips of slip-in design with replaceable seats.

The 3-in-1 torch handle may be rotated to accommodate cutting jet lever in under or over-handle position. Trigger may be installed.

The torch is available in head angles of 75 and 90°. Two- and three-hose models are for use in popular makes of automatic cutting machines.

Smith Welding Equipment Corp, Dept P854, 2633 Fourth St, SE, Minneapolis 14, Minn

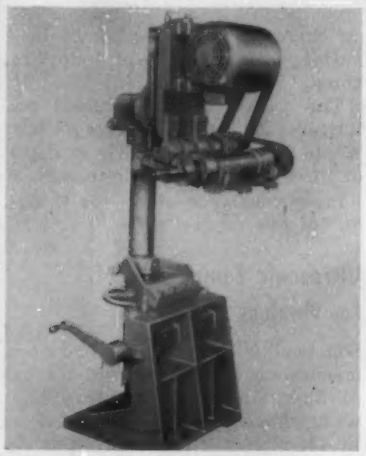


Balancing Machine

One of series of nine heavy-duty static and dynamic machines for balancing small and medium-size rotors is shown above. Readings are indicated in terms of unbalance correction procedure selected. Indications are controlled by three push-buttons.

Carriages are cantilever-mounted from machine frame bars. Impulses from vibration pickup are amplified by multistage electronic unit. Available in floor- and bench-mount types.

Balance Engineering Co, Mac Dell Sales Div, 850 W Lake St, Chicago 7, Ill

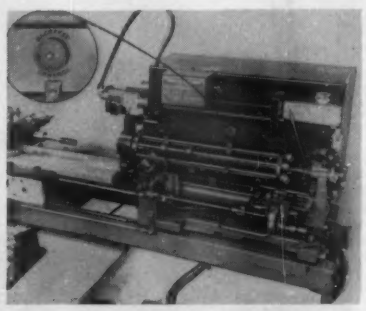


Buffing Head and Stand

Polishing-buffing head and stand unit, model 50-99, has a 3, 5, or 7½-hp, 1750-rpm motor or 10-hp, 3500-rpm motor. The head has a max float action of 4 in. to follow surface of irregular parts.

Power wheelhead can be furnished. Head is equipped with ammeter as standard equipment.

Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich

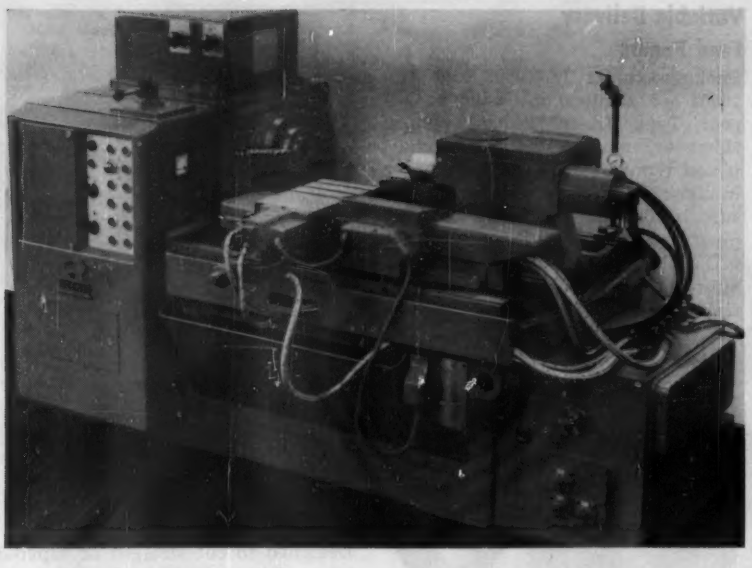


Turret Backfeed

Backfeed can now be applied to any turret station with Lynn hydraulic drive for turret lathes.

Feeds of infeed and backfeed are adjusted independently. With this feature it is possible to make a rough cut going in and a finish cut coming out.

Lincoln Industries, 1123 S 7th St, Minneapolis 4, Minn



Production Lathe Uses Electro-Hydraulic Control

Loewe DP 604 with 20-hp-drive motor has electro-hydraulic controls and the front compound rest can be used as a copying slide rest or multiple tool rest without resetting. It is fitted with a tracer which follows the contours of a flat templet. Fixed dog stops permit multi-cutting without templets or a combination operation.

The rear support is independent with tailstock operated by compressed air. Versatility is provided by the fact that the rests can be mounted anywhere along the bed or replaced by special fixtures.

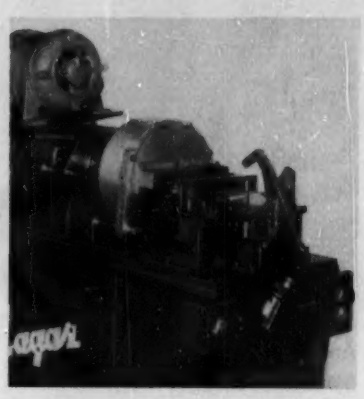
Sequence of operation is semi-automatic by control lever movable in two planes. A smaller model DP506 has a carriage designed for longitudinal turning and rear slide for downcutting.

Imported by Eric R Bachmann Co, 27-11 41st Ave, Long Island City, NY

Limit Switches

Series L-100 heavy-duty limit switches now provide 70% over-travel in operation. Greater margin is accomplished without use of cams, levers, or extra springs. Purpose is to facilitate faster installation.

R B Denison Mfg Co, 102 St Clair Ave, NW, Cleveland 13, Ohio



Special Drilling Equipment For Close-Center Spacing

New machine includes hydraulic feed unit, fixtures, and 37-spindle gearless drillhead. In two passes, 74 holes are drilled in a gas burner. Production is 70 parts per hr with automatic cycle.

Air-actuated fixture clamps burner. Feed unit delivers drillhead to work, feeds head into casting, and returns head to start position.

Zagar Tool, Inc, 2400 Lakeland Blvd, Cleveland 23, Ohio

Centerless Grinder

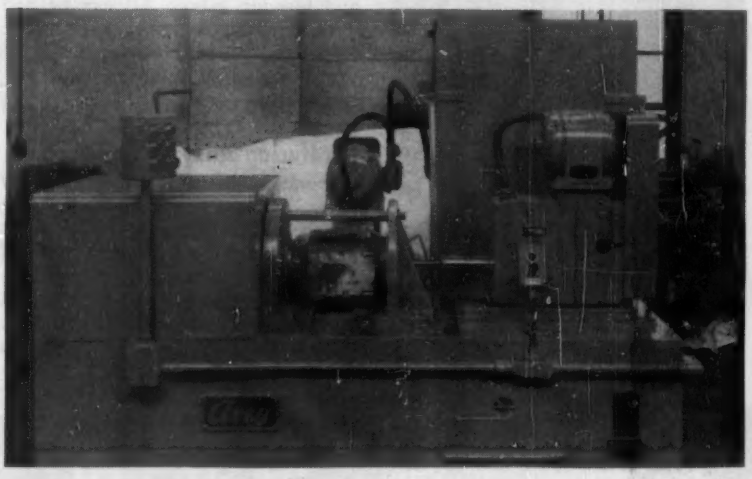
Model 20 centerless grinder is made by Herminghausen Works of Germany. Tapered work can be performed by both infeed and throughfeed methods with capacity from 1/32 to 1¼ in. A 12x4x5-in. grinding wheel is powered by 5-hp motor. Coolant is fed by separate motor-driven pump through filter. Basic unit sells for $4000.

Imported by American Herforder Corp, 1546 N Orleans, Chicago 10

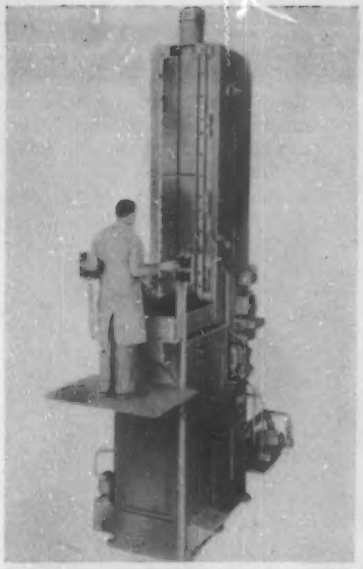
Polishing Contact Wheel

The TF-54 is made of a red rubber compound, abrasive and oil resistant, which offers high-tensile 20-durometer wheel to run at 10,000 sfpm. Wheel is dynamically balanced and has demountable rim or tire. It is serrated with ¼-in. lands and ¾-in. grooves, as well as rubber side flanges to prevent edge wear.

Chicago Rubber Co, 2640 N Clybourn Ave, Chicago 14



BUSHINGS are inserted automatically by machine using two Avey cam feed units plus hydraulic cylinder — all mounted on fabricated steel base. Steel bushing is pressed into part (transmission case), inserted bushing is reamed while two small holes are drilled for name plate. Production is 360 parts per hour. Operating units are interlocked through JIC electrical control panel — *The Avey Drilling Machine Co, Cincinnati 1, Ohio*

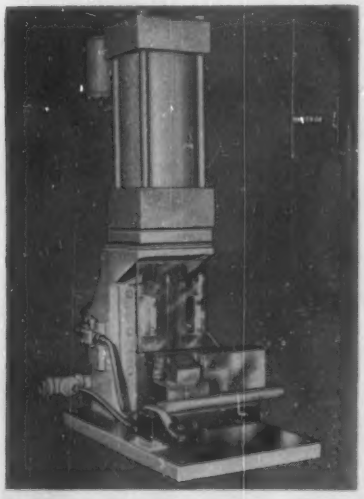


American Vertical Hydraulic Surface Broaching Machine

The SB-90-15 has 90-in. stroke and 15-ton work capacity, was developed for machining jet engine alloys, but is suitable to other surface broaching applications.

Specifications include: variable broaching speed, 5 to 30 fpm; return speed, 60 fpm; work height, 9 ft; over-all height, 19 ft.

American Broach & Machine Co, 415 W Huron St, Ann Arbor, Mich



Broaching Machine

Bond machine takes up less than 2 sq ft of bench space and requires only 60-psi pressure. Custom-made jigs and fixtures make possible a positive hold on work. Machine has the ability to perform on flat or contour surfaces.

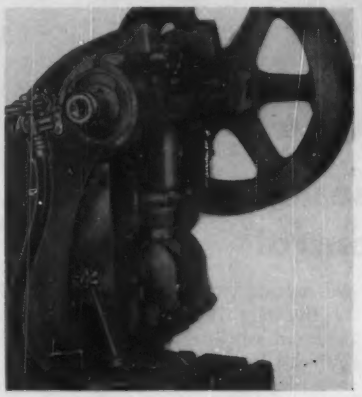
Bond Tool and Mfg Co, Waterbury, Conn

Variable Delivery Feed Pumps

Packaged units JK-10602 and JK-10604 are identical in design to Oilgear Type JK-10203 feed pumps. However, variable-delivery radial-piston pumps are four times larger in capacity. Maximum feeding pressure is 1000 psi; maximum traverse pressure is 300 psi.

Dual, direct-solenoid-actuated, built-in control valves provide control in response to remote pushbutton or limit switch.

The Oilgear Co, 1560 W Pierce St, Milwaukee 4, Wis



Air Blast Valves

Delayed-action valves are built to blow after cam has passed over valve roller. Valve is required on compound blanking dies and similar jobs.

The complete line now includes air blast, standard, delayed-action, and bleeder valves. All can be had with hose, mounting brackets, nozzle assembly, and cam or cam strap.

F J Littell Machine Co, Air Div, 4105 Ravenswood Ave, Chicago 40,

Hardfacing Alloy

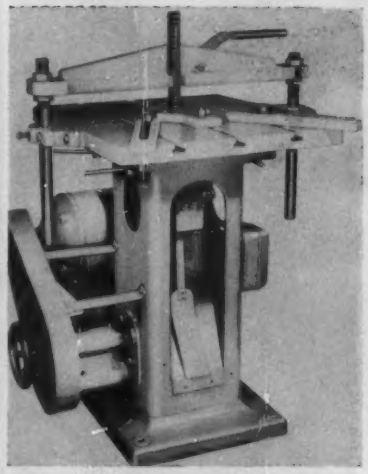
Chrome-cobalt-tungsten alloy No. 6 is available as a hardfacing rod for oxyacetylene torch application. It provides high-impact corrosion and abrasion resistance, and resists oxidation. Deposits of the material can be machine ground to a high finish.

Wall Colmonoy Corp, 19345 John R Street, Detroit 3

Aluminum or Steel In Pre-Coated Coil

Coil-Cote is available in any choice of color finish. Can be formed, bent, drawn, pierced, and fabricated. It is said to eliminate waste and rejects caused by poor paint adhesion, drips, or runs.

Andwall Mfg Co, Ixonia, Wis

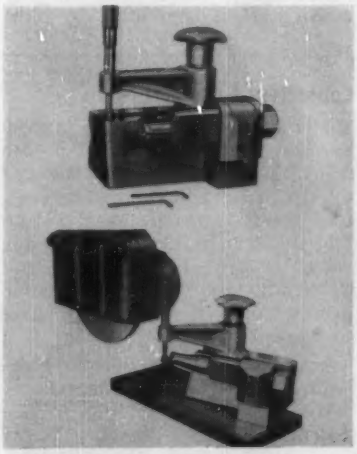


Keyseater Cuts Straight Or Tapered Internal Keyways

Designed to cut straight or tapered internal keyways from ⅛ to 1-in. in width, Model K-6 has a crosshead provided with dovetailed gibs for adjustment of cutter and to take up wear. Cutter action is always perpendicular to the table and bore.

The table can be moved forward or back by handwheel, and slotted clamps are furnished for locating oblong or off-center hub work. Multitooth broach is said to eliminate breakage. Standard motor is 1 hp.

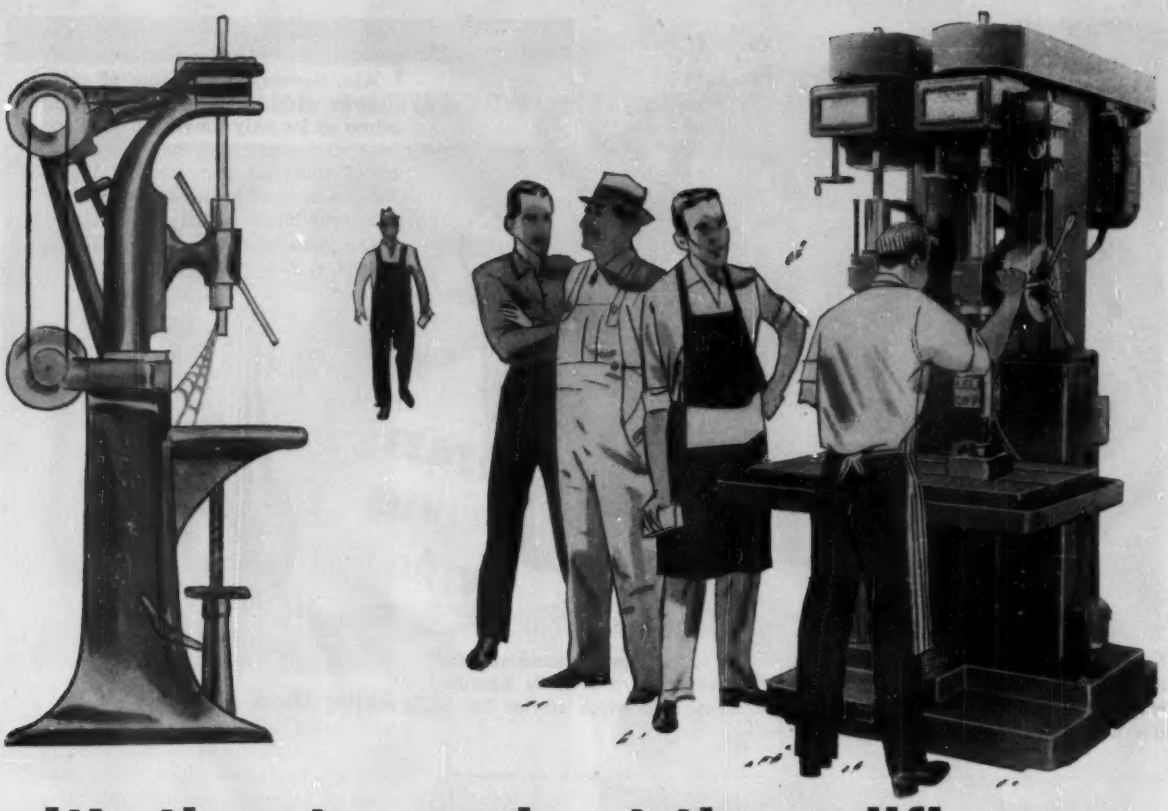
Northfield Foundry & Machine Co, Northfield, Minn



Micrometer Grinding Fixture

This fixture allows setting the proper offset when sharpening circular form tools and recessing tools. Top face is used for adjusting micrometer to centerline of cutter. Micrometer arm swings to any position for gaging and may be removed. Price, without interchangeable adapters, is $130.

Scully-Jones & Co, 1901 S Rockwell St, Chicago



It's time to weed out the wallflowers

When operators stand in line to use a new Leland-Gifford Drilling Machine rather than the old belt driven model (it actually happens), it's time to check up.

You'll find plenty of good reasons for their choice. First of all, new Leland-Gifford Machines are easier to use. With convenient central controls, reduced work handling, more speed and built-in safeguards against costly errors, the average operator can *greatly increase machine production* with no more effort on his part. With the added advantage of higher precision, he can do *better* work, too.

If drilling machines in your plant are turning into "wallflowers", it will pay you to look into the complete line of modern Leland-Gifford Motor Spindle Drilling Machines. Write for complete information or call the office nearest you.

SAVE DAYS — CONTACT THE OFFICE NEAREST YOU ▼

LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

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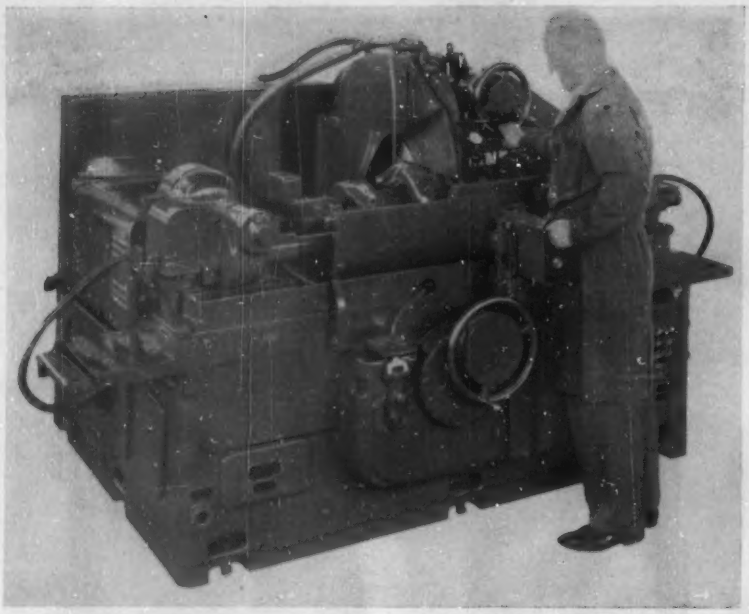
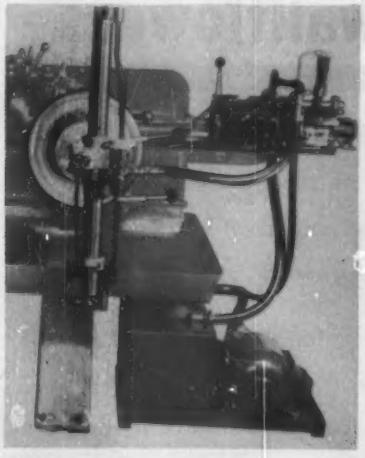
  2515 West Peterson Ave.
- **DETROIT**
  10429 West McNichols Rd.
- **CLEVELAND 21**
  P. O. Box 217
- **NEW YORK OFFICE**
  75 South Orange Ave.
  South Orange, N. J.
- **LOS ANGELES OFFICE**
  2620 Leonis Blvd., Vernon 58, Cal.
- **INDIANAPOLIS 6**
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Roselawn Station



SMALL CRANKSHAFTS have pins ground on 10-in. type H machine which handles 16- or 34-in. lengths. Clamping fixtures are hydraulically operated. Hand and hydaulic feed are provided for wheelhead which carries 36- in.-dia wheel — *Landis Tool Co, Waynesboro, Pa*



Ram-Type Turret Lathes Become Semi-Automatic

Installed without structural changes, drive is adaptable to any standard turret lathe with six stations. The turret drive is powered by a hydraulic fluid motor attached to the capstan wheel.

The conversion unit gives these automatic features: rapid approach at max of 330 ipm; infinitely adjustable feed from 0 to 120 ipm on each station; individual dwell control; and quick return and controllable index.

Kwick Tool & Mfg Co, 801 Sexton Bldg, Minneapolis, Minn

Pillow Block Bearings

Oil retention capacity is reported to be feature of line of lowcost pillow block bearings and flange bearings. They incorporate oil metering principle said to extend lubrication life.

Permawick is a wicking material claimed to hold nine times its weight in oil. Blocks are available in both light and medium-duty model with bores ranging from ½ to 1¼ in.

Congress Drives Division, Tann Corp, 3750 E Outer Drive, Detroit 34

Spray Finishing Equipment

The gun illustrated simultaneously sprays plastic resin and catalyst. Resin is fed to gun through fluid line and catalyst is introduced through the air stream. There is a single pressure control for the resin and double pressure control for the catalyst.

Also developed is a line of paint heaters with a hot-water circulating pump as its only moving part. Each heat exchanger will heat up to 32 oz of material per minute. Water for the system is heated in a separate unit located conveniently.

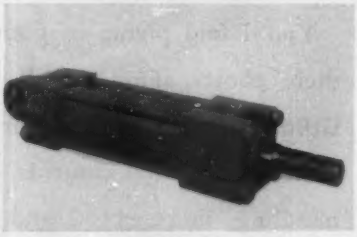
The DeVilbiss Co, 300 Phillips Ave, Toledo 1, Ohio

Milling Chuck

The Jahrl milling chuck (JAL) is being manufactured in this country by J&S. The inner taper of the nose does not rotate against matching taper of collet. The clamping nut is provided with a ball bearing; collet is not submitted to radial force while chuck is tightened. In addition, the collet is made with a locking taper which is released automatically when nut is turned ccw one rev.

The chuck reportedly provides a method of holding milling cutters with cylindrical shanks so they do not slip or draw out.

J&S Tool Co, Inc, Livingston, NJ



Cylinders for Automation

Series S cylinders are operated by air or oil with pressures to 1000 psi. U-cup seals on piston and rod have flexible lips and heavy web sections. Piston rod seal and rod wiper are mounted in single cartridge. JIC hydraulic and pneumatic standards are met.

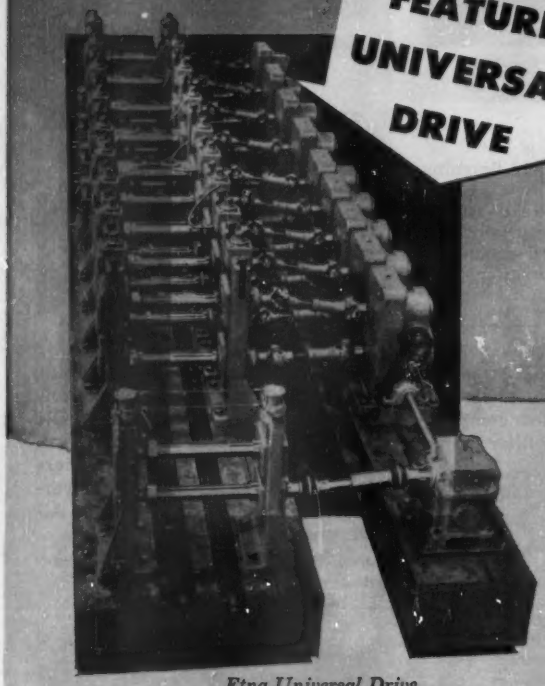
Units are offered in bore sizes from 1½ to 8 in. and in 7 mounting styles. Any stroke length is available.

Hydro-Line Manufacturing Co, Pike Rd, Rockford, Ill

LEADING THE INDUSTRY IN DESIGN . . .

Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive

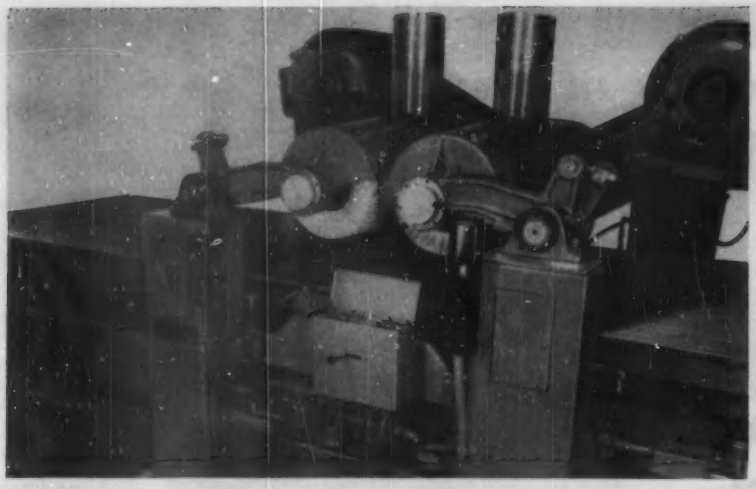
You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced.* Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

3404 MAPLEWOOD AVE., TOLEDO 10, OHIO



Horizontal Polishing Machines Have Hydraulic Contour Device

These horizontal tandem roll polishing machines feature electro-hydraulic-controls—a patented contour device which automatically follows the contours of shaped pieces. The tandem roll arrangement permits rough-cut, or cut-down, and finishing at one setup.

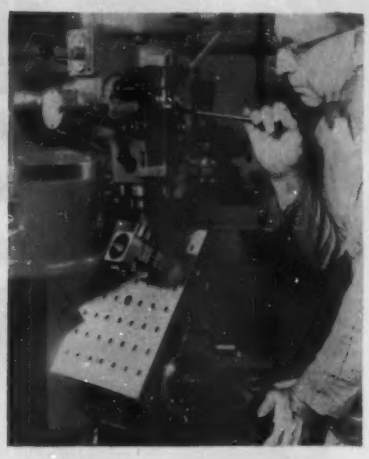
Stroke is from 2 in. to full capacity. The worktable, in any width or length, may be oscillated crosswise.

Central Machine Wks, Worcester, Mass

Silicon Polymer

Polymer termed 410 Gum can be vulcanized with sulfur and blended in any proportion with organic rubbers. Brittle points in range of –70 F and usefulness at temperatures up to 400 F can be realized by proper blending. It can also be blended with oil-resistant rubbers to increase their stability to contact with hot oil.

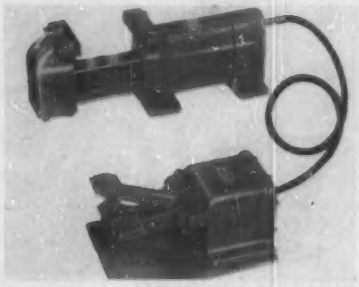
Dow Corning Corp, Midland, Mich



Compound Angle Computer

Three axes of rotation—horizontal, vertical, and radial—are incorporated in this angle computer available in five models. The horizontal protractor is equipped with two verniers set at 90°. Vertical and radial verniers have one protractor each. All have one-minute graduations.

Angle Computer Co, Inc, 1709 Standard Ave, Glendale 1, Calif



Hydraulic Vise and Press

Hydraulic bench vise and press features removable jaw plates and divided front head for such operations as punching, broaching, and removing gears and pulleys. Special jaw plates can be made for bending, forming and pressing. Pump supplies 5000 psi; operations are controlled by three pedals. Jaw opening is 5 in.; depth of throat, 3 in.

Railcens, 120 N Wisner St, Jackson Mich

Pencil Grinder

Nu-Jett pencil grinder incorporates fingertip-speed-control heads. The model weighs under 6 oz and has a collet guard which serves dual purpose of avoiding possibility of using oversized mounted point or cutting tool as well as protecting fingers. Guard also directs stream of air upon tip of cutting tool to clear chips.

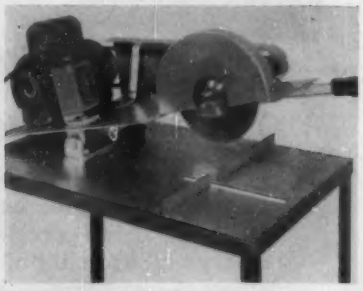
Grinder runs at minimum of 100,000 rpm and is furnished complete with specially designed filter lubricator. Price is $42.50.

Air Equipment Corp, Grand Rapids, Mich

Air Tool Lubricator

New line of Micro-Fog lubricators for air tools and cylinders has an adjustable variable-vane venturi to meet wide range of conditions. Line includes 20 models in pipe sizes from ¼ to 1 in., capacities from ½ pt to 4½ gal., and flow range from 5 to 250 cfm at 80 psi.

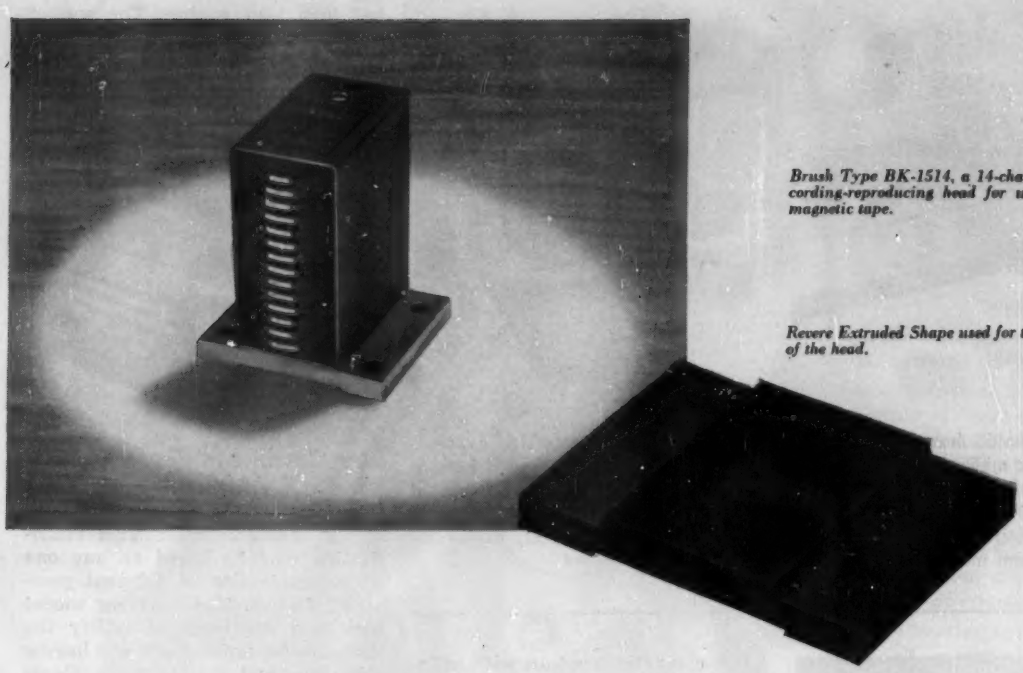
C A Norgren Co, 3436 S Elati St, Engelwood, Calif



Portable Cutoff Machine

Century 85-lb cutoff machine has heavy welded steel belt and blade guard which accommodates blades up to 10 in. The spindle shaft is mounted on sealed precision ball bearings. Fences provide for straight or miter cut. Machine will cut through 5-in. steel pipe or 7-in. aluminum extrusion. Price is $131.

Aluminum Enterprises, Inc, 17815 Cliff Ave, Detroit 12



Brush Type BK-1514, a 14-channel recording-reproducing head for use with magnetic tape.

Revere Extruded Shape used for the base of the head.

Revere Extruded Shape

Saves 15¢ per piece

For Brush

The base of the magnetic recording-reproducing head shown here is a Revere brass extruded shape. You can see that it is rather simple in design, yet Brush Electronics Co., Cleveland, Ohio, reports that the shape saves 15¢ per piece (1½" long) over the previous method of milling the piece out of solid bar. There were three operations required on the bar, which weighed 1.61 lb. per foot, against 1.22 lb. per foot for the shape. Eliminating the machining operations, and reducing scrap almost to the vanishing point, produced the economy.

The head in question can record and reproduce signals from 14 channels, at frequencies within, below, or above the audible range. Such a head is being increasingly employed to handle information to be used for computation, telemetering, inventory records, process control (automation) and similar purposes.

Extruded shapes by Revere should be looked into if you are doing any extensive machining of raw stock in copper and its alloys, and aluminum alloys. The extrusion process is much like squeezing paste from a tube. Much more intricate shapes than the one shown here are possible. Naturally, all design lines must be parallel to the axis of extrusion. Get in touch with the nearest Revere Sales Office, and see if Revere Extruded Shapes may not save you money.

REVERE

COPPER AND BRASS INCORPORATED

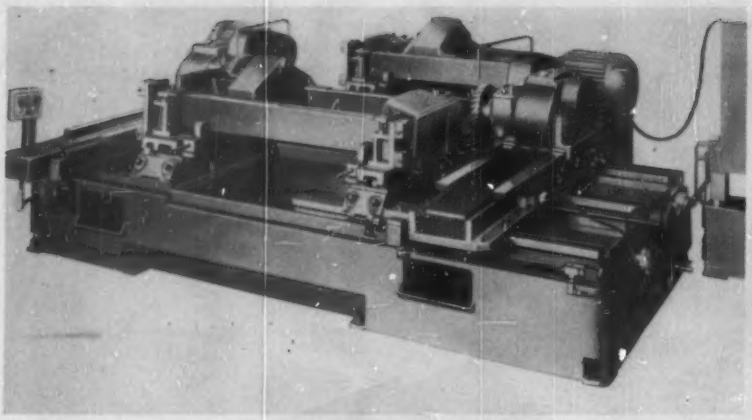
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

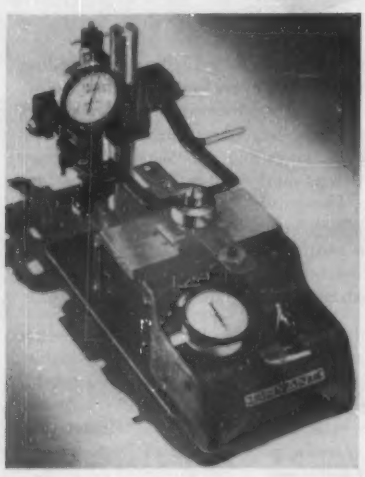
• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



TRACTOR FRAMES have both ends milled on new machine which expands line of duplex milling machines featuring heavy-duty traveling heads instead of moving table and fixtures. Saddle is mounted on ways to allow adjustment of 6 in. to 11 ft for length of work. Ways on saddle provide for mounting second traveling head. Heads are standard M&M model M-30, driven by 30-hp, 1800-rpm motors — *The Motch & Merryweather Co, Cleveland*



Thread-Checking Attachment

Bryant has introduced a squareness-of-face attachment for use with Model 21 thread gage in checking internal and external threads. It accommodates face diameters from ¼ up to 7 in. Indicator gives direct reading of total face run-out with the thread axis.

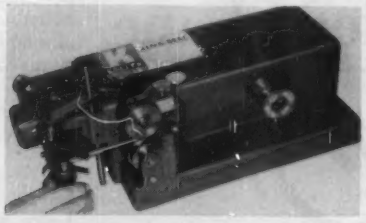
Attachment can be arranged to check either an upper or under surface. A compression spring maintains constant pressure between contact points and work.

Bryant Chucking Grinder Co, Springfield, Vt

Magnetic Flow Meter

Electro-magnetic flow meter for 2 to 8-in. flow lines will measure volume flow of any liquid of sufficient conductance and velocity. It consists of a non-magnetic flow tube with an insulating liner containing flush-mounted metallic electrodes and surrounded by an ac electromagnet.

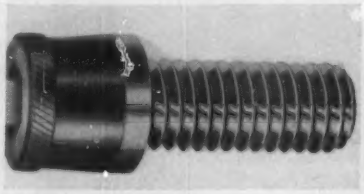
The Foxboro Co, Foxboro, Mass



Ring-Forming Tool

Tool for forming rings of soft solder or brazing alloy directly onto part to be brazed is a compact bench-type air-operated unit which automatically forms the ring. Calibrated adjustments permit forming rings with dia from ¼ to 3 in.

Keller Tool Co, Grand Haven, Mich



Socket Cap Screw Has Wedge Action

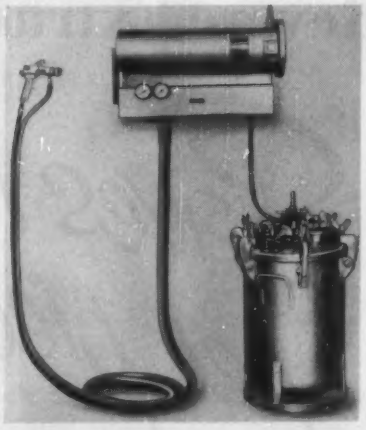
Led-Lok is a socket-head cap screw said to withstand loosening and leaking. Design includes a tapered chamfer shoulder beneath which is a half-inch lead washer. The washer locks and seals the head by forming an alloy wedge.

Safety Socket Screw Co, 6501 Avondale Ave, Chicago 31

Gear Classifier

Three-way classifier separates gears into acceptable, salvageable, and non-salvageable categories. This classification may be based on any one or a combination of different gear-sizing factors. The conveyor model has been developed to satisfy the demands for units which will handle wide-face and cluster gears. Gears enter from the left side on a continuous belt conveyor.

Michigan Tool Co, 7171 E McNichols Rd, Detroit



Hot-Spraying Method

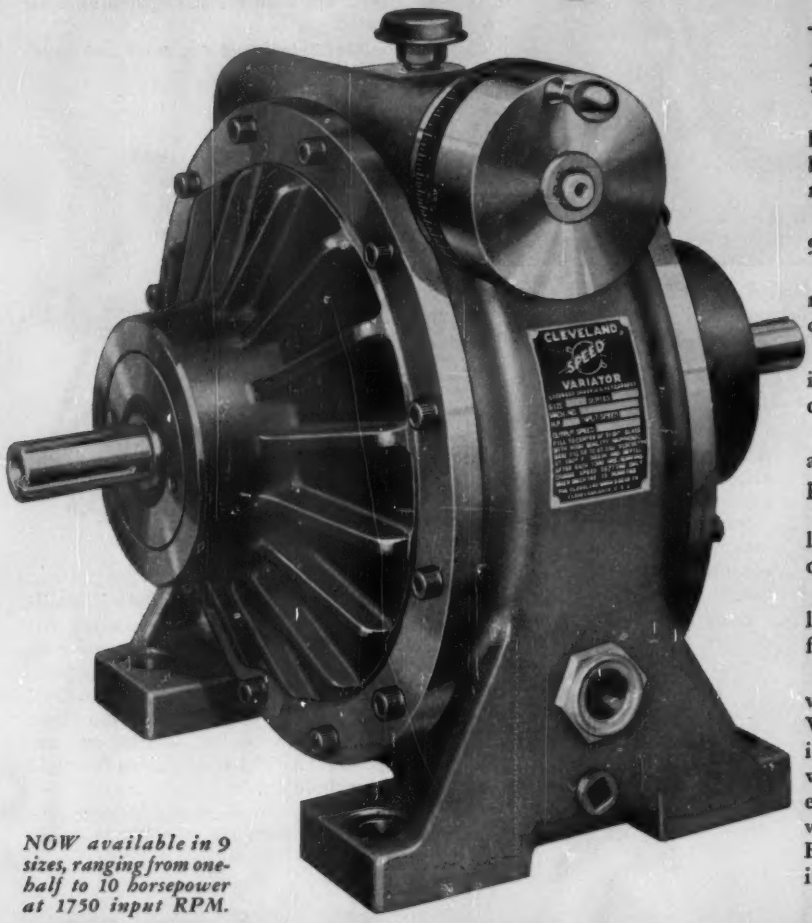
Therm-o-spray, introduced by Swedish Machine Corp of Stockholm, keeps paint under constant pressure and temperature, even during interruptions in spraying. Compressed air for atomization first passes through thermostat-regulated explosion-proof electric air heater where air is heated to 300 F. Air then heats paint in paint coil. Compressed air, reduced to 75 or 100 F, passes then to spray gun for atomizing heated paint. During interruptions, heat is maintained by regulating valve.

Imported by Special Equipment Corp, 26 W Putnam Ave, Greenwich, Conn

Can you use a compact drive with infinitely variable speeds?

HERE IT IS

Cleveland Speed Variator



NOW available in 9 sizes, ranging from one-half to 10 horsepower at 1750 input RPM.

INFINITELY variable, stepless speeds within a 9:1 range (from ⅓ to 3 times the input speed).

Smooth, instant change of speed by simple manual adjustment or by remote control devices, either manual or power operated.

Operating efficiencies—75% to 90%.

Coaxial input and output shafts, rotating in same direction, either clock-wise or counter clock-wise.

Ample bearing support for both input and output shafts to carry overhung pulleys.

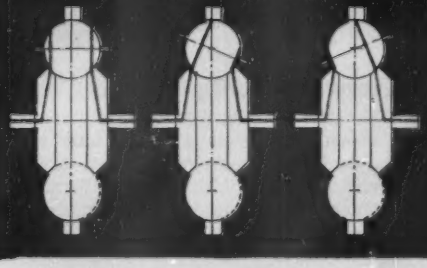
Compact and inherently quiet and smooth running, due to simple construction.

Minimum maintenance and long life, due to absence of belts and other complicated linkage.

Performance proved by prolonged tests in the laboratory and field operation.

These are the outstanding advantages of the Cleveland Speed Variator. It is now ready for service. Immediately applicable to a wide variety of machines and equipment where a dependable variable speed drive is required. For detailed description and specifications, write for Bulletin K-100.

HOW THE CLEVELAND SPEED VARIATOR WORKS



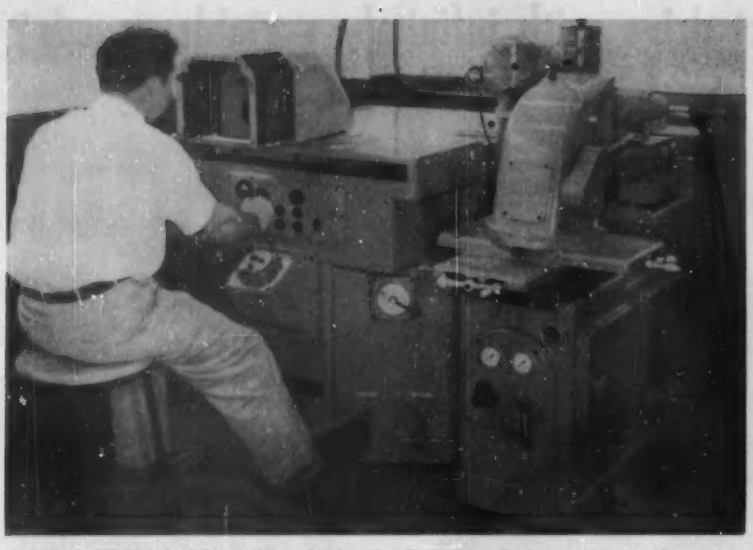
Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts.

Relative speeds of the shafts are adjusted by changing the positioning of axles on which the balls rotate (see diagrams, left, and cutaway view, right).

THE CLEVELAND WORM AND GEAR COMPANY

Speed Variator Division, 3254 East 80th St., Cleveland 4, Ohio

Sales Representatives in all major industrial markets



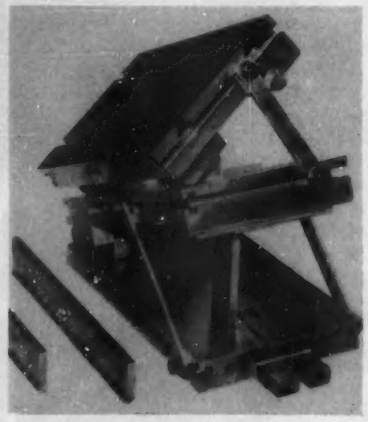
OPTICAL PROFILE GRINDER is hydraulically controlled. Profile is drawn on plastic sheet to any scale between 10:1 and 50:1. Projection table with the layout, is moved hydraulically and controlled by two levers — *McGlynn Hays Industries, Inc, Belleville 9, NJ*

Vertical Grinder

Lightweight vertical grinder handles cup wheels, cutoff wheels, sanding pads, and wire brushes. Speeds of 8000, 6000, and 4500 rpm are controlled by governor threaded into rotor shaft. Dead handle is removable for one-handed operation.

Automatic oiler and air strainer are built-in. Helicoil steel thread inserts are used for strengthening cast parts.

The Rotor Tool Co, 26300 Lakeland Blvd, Cleveland 23



Sine Plate

Compound angle sine plate is available in 5x10 and 10x20-in. sizes. All surfaces are ground to give over-all accuracy of ±0.0002 in. of any position when set with gage blocks. Unit is furnished with a slotted top plate, sine bar for setting angles, and adjustable height edge guides for rigid workholding.

Fleming Engineering Service Co, 7001 Glen Hills Rd, Fort Worth, Texas

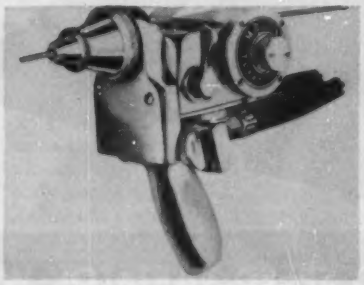
Low-Cost Drillpress

This 14-in. drillpress has a new pivoting motor-mount plate permitting quick belt tension release. After speed change, spring-loaded plunger automatically restores correct operating tension. Modified quill now allows 4-5/16-in. spindle travel. Depth gage can be set to zero when drill contacts work. Self-locking depth stop is calibrated to 0.002 in.

The worktable incorporates these new features: clamping ledges at sides and T-slots; table-tilt angle scale; tapered expanding bushing. New base for bench models has ground working surface 1/3 larger than previous models. Machine is also designed to incorporate push-button starter in front.

There are 40 models in the line, including single or multiple spindle models. Single-spindle models are $83.50.

Delta Power Tool Div, Rockwell Mfg Co, 437 N Lexington Ave, Pittsburgh



New Turbo-Jet Metallizing Gun

Turbo-Jet sprays fine dense coating using wire from 20 gage to 3/16-in dia from highest-melting-point molybdenum to lowest-melting-point wires. Dual roll feeds are individually driven.

The gun will operate on acetylene, propane, or natural gas at 15 psi. It has magnetic controlled governor which gives controlled turbine power using 60-psi air with a wire speed range from 2½ ipm up to 20 fpm.

Metallizing Co of America, 3520 W Carroll Ave, Chicago 24

Length Measuring Machine

Designed for external and internal measurements to 120 in., unit accomplishes readings by steel scale and vernier to 0.001 in. and 1/50 mm. Over-size vernier is 2.450 in. long and adjustable.

Device is used as master or check, and for setting large mikes, snap gages, end measuring rods, and standard bars.

George Scherr Co, Inc, 200 Lafayette St, New York 12

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING

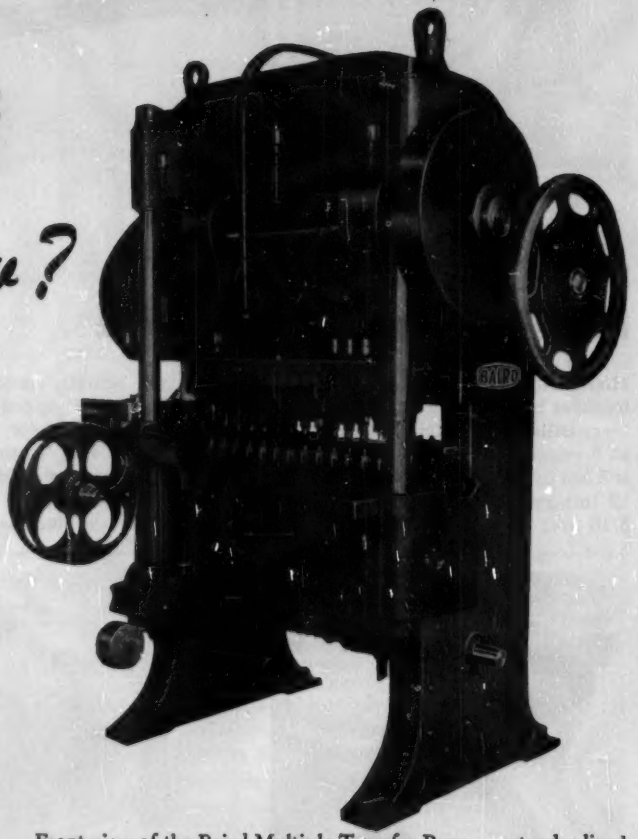
Biting off *More* than you can *Chew?*

Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

Almost-human transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc., complete the piece.

Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"

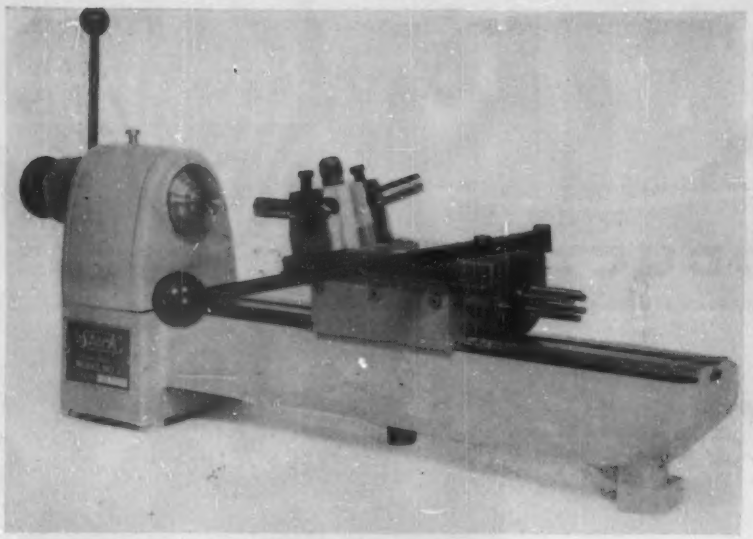


Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed at high speeds.

SEND FOR TRANSFER PRESS BULLETIN

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

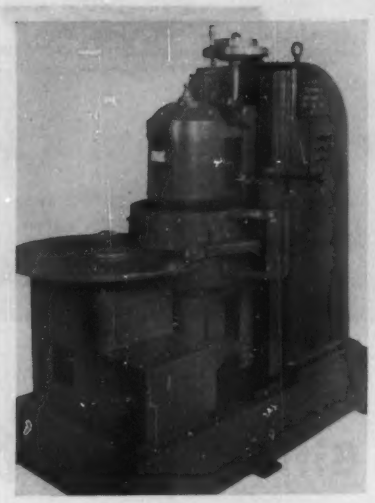
AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS



Six-Inch Sling Lathe Has Ball-Bearing Headstock

Model No. 2 lathe with 22-in. bed features ball-bearing headstock with lever collet closer and V-belt, as well as 6-position turret. Swing over bed is 5.905 in.; distance between centers, 12 in.; maximum collet capacity is 5/16 in.; maximum spindle speed, 18,000 rpm. Spindle speeds available with the variable speed drive are: 600 to 5000 rpm (pulley ratio 1:1); 1200 to 10,000 rpm (ratio 2:1). The overall length of the Model No. 2 is 24 in.; length of bed is 22 in.

Stark Tool Co, Waltham 54, Mass

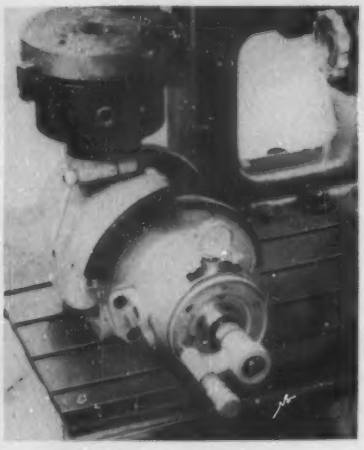


Vertical Double-Spindle Unit Grinds Two Parallel Faces

No. 2V-18 vertical double-spindle grinder was built to grind two parallel faces of small pieces simultaneously. Pieces are loaded by hand into power-driven circular work carrier. Speed ranges from ⅛ to 1 rpm are obtained from rotary carrier by adjustment of hydraulic mechanism.

Two 18-in.-dia abrasive disks are driven by 5-hp motors. Hand-operated swinging arm dresser has pivot shaft fully enclosed. A wet grinding system can be provided.

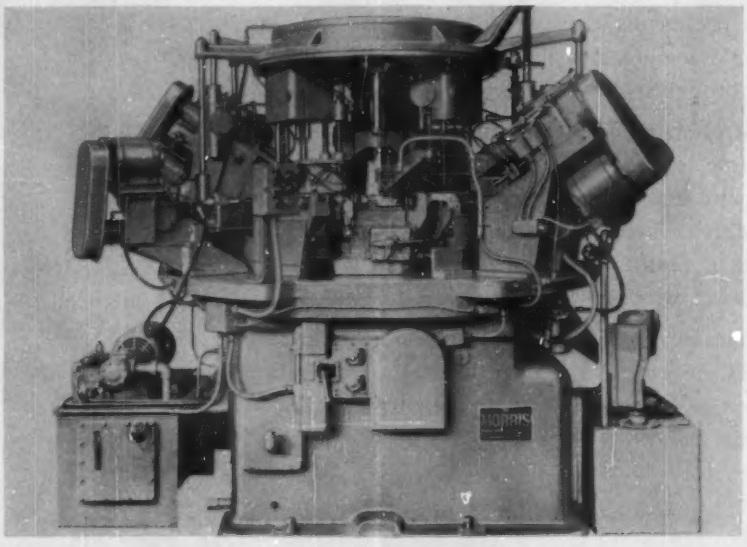
Gardner Machine Co, Beloit, Wis



Dividing Head Utilizes One Indexing Plate

Hommel universal dividing head uses one indexing plate containing six holes. This plate, together with the dial indicator, allows any division to 12 seconds of arc. This is possible with work spindle in any position. Angular setting of spindle can be made to five minutes.

McGlynn Haye Industries, Inc, Belleville 9, NJ



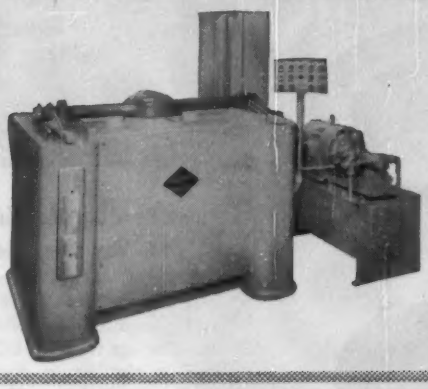
FOUR-BARREL CARBURETOR PARTS have 23 operations performed on them for production rate of 375 pieces per hour on 675 machine. Standard base indexing table, center column, straight and angular drilling heads, cooling and hydraulic systems are incorporated. Six rack-fed auxiliary heads mounted on a platen surrounds indexing load table. Auxiliary heads perform horizontal and angular operations. Center column carries mushroom head hydraulically actuated to feed vertical spindles. Automatic lubrication is provided — *Morris Machine Tool Co, Cincinnati, Ohio*

New IMPCO "Automated" Machinery

SPEEDS Automatic DRILLING, CHAMFERING, COUNTER-BORING, BURRING, and POLISHING

Are your faced with production problems requiring special machinery? Here are 3 *profitable* IMPCO solutions to specific production problems

1



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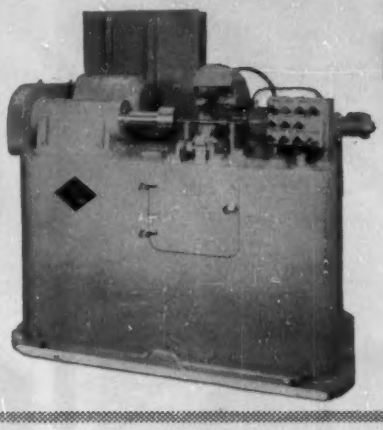

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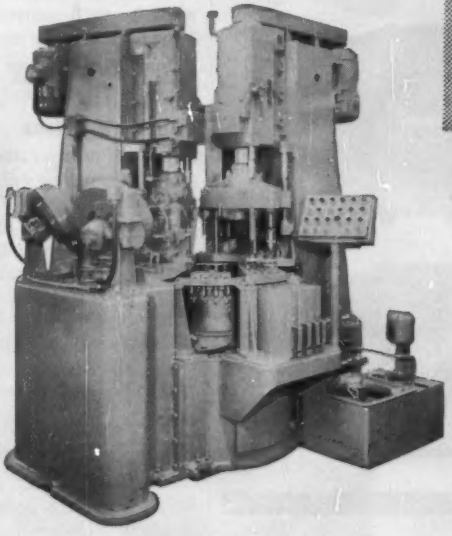


1 IMPCO Backchamfering Machine

Backchamfers 10 carrier bolt holes on inner back flange face of automobile rear axle housing at the rate of 280 PCS PER HR.

Axle housing is transferred to the machining station, backchamfering tools automatically swivel in position to chamfer the holes, retract and return to starting position. Part unloads automatically.

2 IMPCO Polishing and Wire-Brushing Machine

Automatically polishes bearing diameter, deburrs shoulder, and automatically wire brushes oil grooves of automobile transmission shaft at rate of 720 PCS PER HR.

Completely automatic. Spindle runs continuously. Abrasive cloth automatically indexes for each operation.

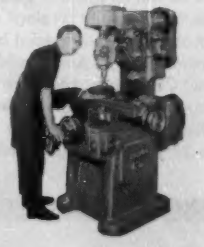
3 IMPCO Automatic Drilling Machine

Loads, drills, counter-bores and burrs automobile valve-lifter parts at rate of 2800 PCS PER HOUR to a tolerance of .0015". Hydraulically indexed table. Machine cycle entirely automatic, or hand-controlled, as required.

IMPCO

Find out how IMPCO engineers can serve you. WRITE TODAY.

IMPCO Model 1-B Vertical Mill



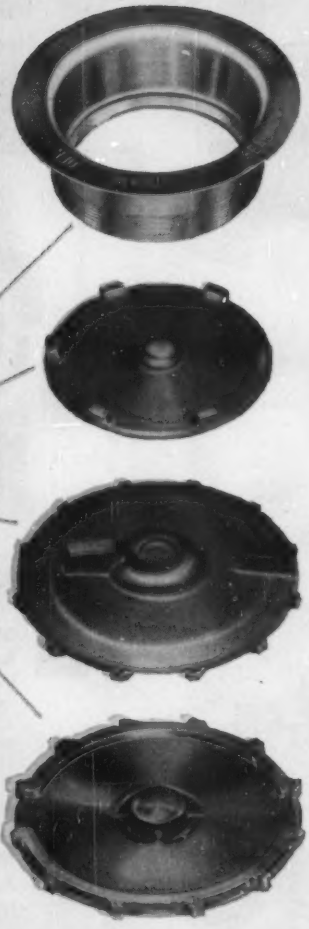
INDUSTRIAL METAL PRODUCTS CORPORATION

Builders of IMPCO Straighteners, the American HEB Pilot Lathe, and Special Machinery

3400 W. ST. JOSEPH STREET LANSING, MICHIGAN

MUELLER BRASS CO. forgings* contribute to the efficiency of this modern waste disposal unit

***MUELLER BRASS CO. facilities include: designing, die-making, forging, tooling, machining, polishing, plating and assembly**



Three Mueller Brass Co. forgings play an important part in the fine operating performance of this modern waste disposal unit made by the Eureka-Williams Co., Division of the Henney Motor Co., Inc. This unit does a speedy and thoroughly effective job of pulverizing garbage and has made life easier for American housewives. The impeller disposer that chops up the waste food in the disposal unit, the disposer cover and the sink mounting flange are all forged by the Mueller Brass Co. This is another outstanding instance where Mueller Brass Co. forgings have improved product performance and cut costs. High quality forgings can be produced from standard and special brass, bronze and aluminum alloys. And in addition, the Mueller Brass Co. offers complete service ranging from product design to finished part . . . Write today for complete information and new 32 page forgings handbook.

1. Sink mounting flange, forged, machined, nickel and chrome plated by Mueller Brass Co.
2. Machined and finished disposer cover forging.
3. Cutting side of impeller disposer forged from 600 series bearing bronze.
4. Reverse side of impeller disposer.

MUELLER BRASS CO.

PORT HURON 23, MICHIGAN

Pines Bending Machines Do Two-Way Operation

Horizontal semi-automatic tube bending machine for both clockwise and counter-clockwise operation handles up to 1 in.-OD steel tubing and is similar in design to Series 1400 unit. It has self-contained hydraulic system, lever-operated toggle-type clamp, pressure die holders, manual angle-of-bend selector with 6- or 8-position turret, and a 3-hp ball bearing motor.

Pines Engineering Co, Inc, Aurora,

Four-Way Valves

These pilot-operated, solenoid-controlled four-way valves provide porting and positioning arrangements in circuits up to 3000 psi. Pilot pressure can be external or internal and change-over is made by rotating valve 180°. Capacities are 20 and 1¼ gpm for ¾- and ⅛-in. pilot and solenoid valves respectively.

Denison Engineering Co, 1160 Dublin Rd, Columbus 16, Ohio

Flame-Cutting Machine

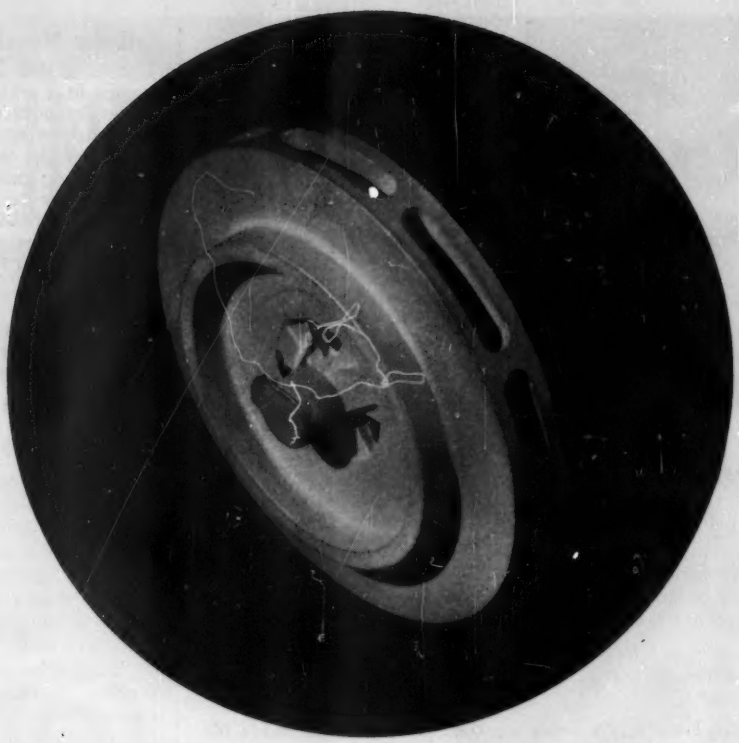
New flame-cutting machine is portable, weighing only 16 lb. It cuts straight line or bevel, circles and shapes, on metal ranging from ⅛ to 4 in. Power is by 110-v, 60-c motor.

The Burdett Oxygen Co, 3300 Lakeside Ave, Cleveland 14, Ohio

Portable Hacksaw

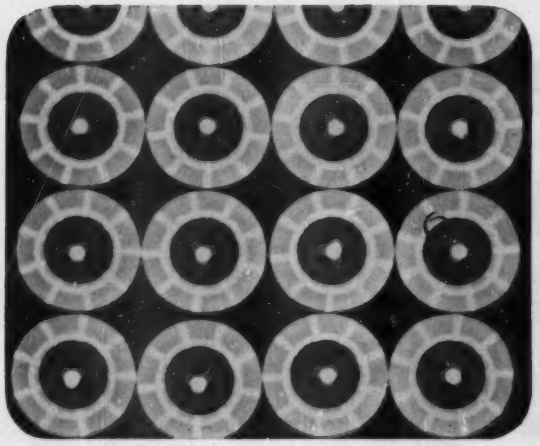
Portable power hacksaw cuts metal, plastic, or fiber stock of 3 in. or less dia, at any angle from 45 to 90°. The saw blade draw cuts and then lifts on return. With the work vise clamped to stanchion, Hand-I-Hack is self-supporting, makes repeated cuts within tolerance of 0.010 in.

Lipe-Rollway Co, Emerson Ave, Syracuse, NY



SPINS LIKE "BLAZES"—

so Radiography checks each one



Radiograph of oil scavenger rotor in variable displacement pump for aircraft hydraulic systems.

"BLAZES" is not the word—but suggests the maker's shorter expression for the rate at which this rotor spins. Fact is, rpms are so high that the soundness of the casting is important in terms of safety as well as serviceability.

So radiography goes to work and plays its unique part. With no damage to the product, radiography looks inside the part and checks each rotor's structure. Only flawless parts will meet the strict requirements of service.

Proving soundness with x-rays has become common practice with more and more suppliers of quality castings. They know it helps build reputations for delivering only good work.

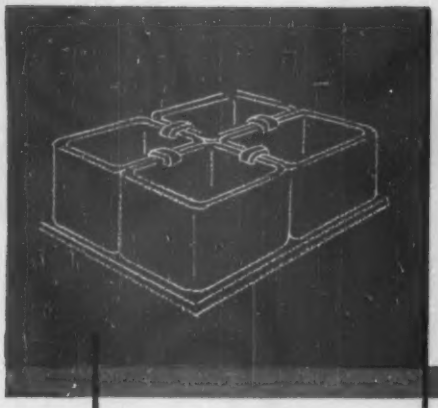
If you'd like details on how radiography can improve your operations, get in touch with your x-ray dealer—or write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N. Y.

Radiography...

another important example of Photography at Work

Kodak



HOLCROFT and the BATCH FURNACE

More Jobs . . . Faster . . . at a Lower Cost

The batch furnace permits you to handle a large variety of jobs—it can be completely automated for faster production—and can deliver volume production at a low, low cost.

For example, in the furnace shown below you can anneal, temper, clean harden, carbon restore, carburize or carbonitride entirely automatically.

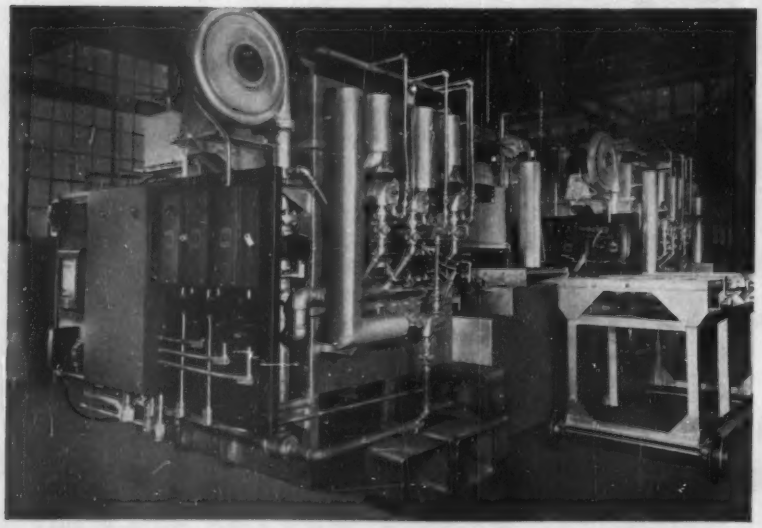
In a batch furnace, the entire work load is positioned inside the chamber and is removed after the heat treat cycle has been completed. Batch furnace may have several stock handling methods: tray, car, cover, elevator, pit, and tumbling barrel depending on the type of stock treated.

Just as great a variety of stock handling methods pop up when furnaces are continuous, that is where successive loads parade through heat treat cycle. You will find a complete description of all types of continuous furnaces and their methods of handling stock in Holcroft's book—Blazing the Heat Treat Trail. You can have a copy if you write today. Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. CLEVELAND, OHIO HOUSTON, TEXAS PHILADELPHIA, PA.

CANADA: Walker Metal Products, Ltd., Windsor, Ontario EUROPE: S.O.F.I.M. Paris 8, France



Cylinder Mounting

The mounting of Model 77 consists of square lugs which mount flush with Miller standard square heads and caps. Advantages include: low centerline height machined to tolerance of 0.002 in.; mounting loads are located closer to centerline; lugs are easily detachable.

Model 77 is available in: 1½ to 20-in. bores in 200-psi air cylinders; 1½ to 12-in. bores in 2000-psi hydraulic cylinders.

Miller Fluid Power Co, 2040 N Hawthorne Ave, Melrose Park, Ill

New Retaining Ring Is Radially Applied

Radially applied retaining ring can be locked positively in its groove and used as shoulder against rotating parts. Known as Truarc Series 5139, ring is of spring steel. Sizes accommodate shafts with diameter from ⅛ to ½ in. Shear strength ranges from 500 lb for the smaller to 2500 lb for the largest.

Wales Kohinoor Inc, Long Island City, NY

Molding Compound

A glass-filled silicone compound for molding high temperature plastic parts, 301 may be molded with conventional equipment by either compression or transfer techniques. Mold shrinkage ranges from zero to 0.0035%. Finished parts may be machined with high-speed tools.

Properly molded parts will stand continuous exposure to 450F plus intermittent exposure to 700F.

Dow Corning Corp, Midland, Mich

Aluminum Welding Electrode

Electrode was designed for use in welding guns employed with existing consumable-electrode, shielded-arc processes. It is produced in three aluminum alloys, 2S, 43S, and A54S. Packaged on fiber spools in sizes from 0.030 to ⅛-in. dia. Tolerances on diameters are + 0.001 to – 0.002 in.

Aluminum Co of America, 738 Alcoa Bldg, Pittsburgh 10, Pa

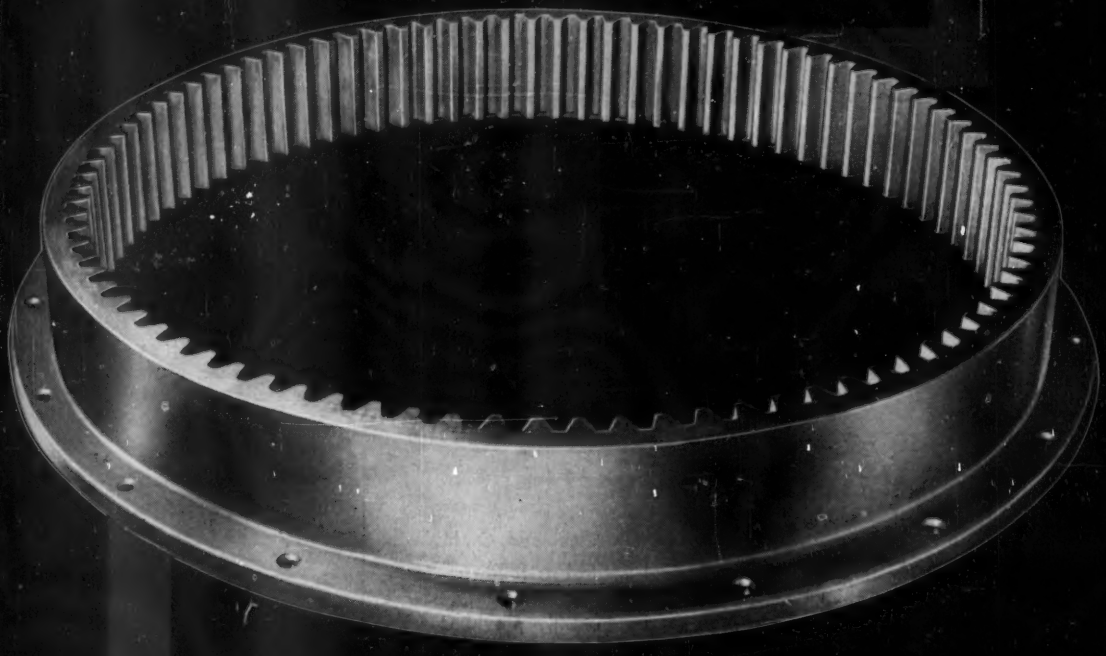
Universal Bench Brake

Model U322 bench brake has capacity stated as a ⅜ flange on 22-gage mild steel, full 3 ft length. Fingers of case-hardened steel in widths of 2, 3, and 4 in. allow box depths to 3 in.

Design features include replaceable bronze bushings, easy adjustments, and simple operation. Price is $148.50.

W Whitney Stueck, Inc, Old Saybrook, Conn

for INTERNAL GEARS...



Philadelphia Internal Gears are widely used in many types of Speed Reducers, Clutches, Transmissions and Power Take-offs utilizing either single pinion or planetary drives.

Internal Gearing is often favored, because of its great strength, increased tooth contact, shorter center distances and more quiet operation than conventional spur gears.

"Phillie Gear" can produce Internal Spur Gears in diameters up to 160 inches, 24 inch face . . . any pitch or material. Also available are Internal Helical Gears in diameters up to 60 inches.

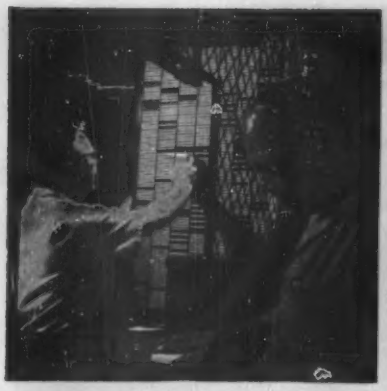
For courteous service and fast action . . . consult "Phillie Gear".

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls



McCaskey Tool Control in Winslow Mfg. Co.'s crib serving production of tools, dies, jigs, fixtures and experimental work.

WINSLOW MFG. CO. reports their McCASKEY TOOL CONTROL *a dividend-paying investment*

Mr. J. A. Price, Gen. Mgr., Winslow Manufacturing Co., Cleveland, O., high-spots results of their investment in McCaskey Tool Control as follows:

"Substantial monthly dividends are earned (1) by instantly providing a dozen or more facts about tools and tooling essential to efficient and economical crib and shop operation, (2) by eliminating non-productive man and machine time that thrives on uncontrolled crib service, (3) by reducing and conserving tool purchases and (4) by minimizing crib overhead.

"Our plant and organization have grown considerably since McCaskey Control was adopted in November 1951 with an experienced, competent manager in charge of the crib. We all feel that McCaskey has proved to be a productive and profitable investment."

McCaskey Tool Crib Control . . . Gage Control . . . Blue Print Control and other Industrial Control Systems . . . will pay similar dividends in your plant, large or small. Write us for complete information. No obligation, of course.

MAIL COUPON TODAY

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street
Chicago 18, Ill.

Please send me all the facts concerning McCaskey Tool Control ☐; Gage Control ☐; Blueprint Control ☐.

Name .....
Position .....
Company .....
Address .....
AM-12-54

McCaskey
INDUSTRIAL CONTROLS
TOOLS - PRODUCTION - COSTS
MAINTENANCE - INVENTORY
Victor Adding Machine Co.,
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street, Chicago 18, Ill.
Galt, Ontario, Canada

Tool Reconditioning

Sharpening and reconditioning of cutting tools, both HSS and carbide, is accomplished with procedure reported not to draw tool hardness. Broken end mills, sharpened-down milling cutters, worn-out counterbores and obsolete slitting saws are said to be cheaply reconditioned. Flutes are recut parabolically. Smooth ground finish results in less heat generation. Work is done on basis of individual quotations.

Manufacturers Cutter Corp, 275 Jefferson St, Newark 5, NJ

Height Gage

Addition to Pla-Chek line provides height gage and micrometer settings within 48-in. range with accuracy guaranteed to 0.0001 in. in 24 in. Heart of gage is deep-frozen, stain-free steel alloy bar. At top of bar large micrometer thimble graduated to 0.0001 in. provides intermediate dimensions. With use of reverse checking plate, gage indicator is set for checking underside of work.

Cadillac Gage Co, Detroit, Mich

Production Welders

Industrial line of ac welders with NEMA rating 300, 400, and 500 amps features stepless current control, silicone insulation, aluminum coil windings, and large current scale. Fingertip current adjustment and quieter operation are possible by coil supports floating in rubber bushing.

Wide current ranges enable welders to be used on most industrial applications. They are available for 220/440 or 550v operation.

General Electric, Schenectady 5, NY

Lubricant Measuring

Hydraulically operated valves for dispensing pre-determined quantities of lubricant have any discharge range desired. They incorporate an adjusting screw at each end of measuring chamber to control quantity. They are used with a four-way control valve supplied with lubricant from power-operated pump.

Lincoln Engineering Co, Industrial Div, 5703-27 Natural Bridge Ave, St. Louis 20, Mo

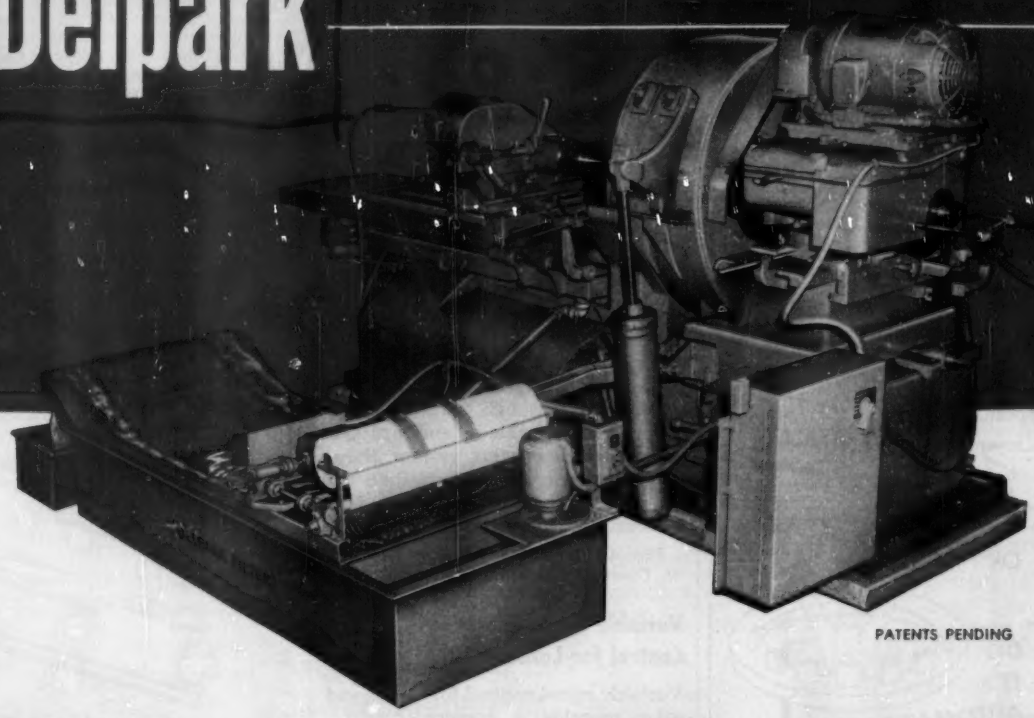
Repair and patching compound called Kwik-Roc, quickly restores cracks and holes in interior concrete floors. Supplied in powder form, material is mixed with water, poured into depression, leveled; traffic may be resumed within 45 min.

Sun Chemical Corp, Long Island City

"Carefree and Inexpensive Operation"

SAYS WILLYS MOTORS, INC.
TOLEDO, OHIO
OF
INDUSTRIAL FILTRATION

Delpark



PATENTS PENDING

The DELPARK Story runs true to form at *Willys Motors, Inc.* Here, where a number of DELPARK Filters are in service 16 hours a day, they operate with little attention at a minimum of cost.

Willys Motors says, "We never have to change the coolant, or clean the tank, excepting perhaps on a six month basis, to remove contaminants from floor sweepings. Time spent in cleaning tanks with conventional equipment would many times pay for the filter equipment."

There is one other point to remember: that DELPARK Filters make possible the full capabilities of fine precision grinders which otherwise would be impossible. Greater machine efficiency and fewer rejects add even more to the enormous savings made possible with DELPARK Filters.

DELPARK engineers are ready to help you with your specific problems. *Write today for more complete information.*

Delpark INDUSTRIAL FILTRATION

Backed by more than 30 years experience in Industrial Filtration
INDUSTRIAL FILTRATION COMPANY • LEBANON, INDIANA

INDUSTRIAL FILTRATION COMPANY
113 Industrial Avenue, Lebanon, Indiana

Gentlemen: We would like more information on DELPARK Industrial Filters applied to coolants.

Name_____ Title_____

Company_____

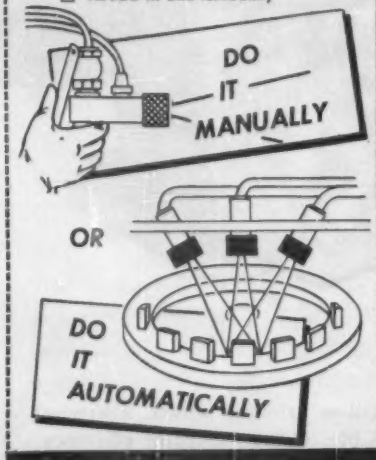
Address_____

City_____ State_____

which of these POLISHING PROBLEMS are yours?

CHECK*

- ☐ Reduction of belt sanding stages
- ☐ Cutting down buffing time
- ☐ Reduction of hand polishing
- ☐ Blending directional grind lines
- ☐ Lowering micro-inch finishes
- ☐ Exposing cracks and fractures
- ☐ Smoothing belt marks
- ☐ Imparting non-directional finishes
- ☐ Semi-reflective surfacing
- ☐ Blending brush marks
- ☐ Surface uniformity
- ☐ Removal of stress marks
- ☐ Obliterating
  - ☐ Scores ☐ Tool marks
  - ☐ Reliefs ☐ Chatter
  - ☐ Pits ☐ Scratches
- ☐ Matte finishing
- ☐ Thread fit and turnability



WITH PRESSURE BLAST WET BLASTING

TWO SPEED

* This ad is your coupon. Check off your problem(s) and mail today for free illustrated literature . . . application data . . . case history information!

THE CRO-PLATE COMPANY INC.

747-A WINDSOR STREET
HARTFORD 5, CONNECTICUT

Plate Handling Aid For Bandsawing Operation

A ball-bearing parallel has been developed to eliminate friction between plate and saw platform and allow fingertip control when handling heavy steel plates on contour bandsawing operation. Parallels can be mounted on Di-Lift tables when workpiece hangs over saw. Size of plate is 2½x6 in. with ⅜-in. balls.

Montgomery Tool, 7 Tichenor Lane, Newark 5, NJ

Silicate Coating

Porcenells were developed as corrosion-proof silicate coatings to fill the need for a permanent and decorative ferrous metal coating at a reasonable price. Ceramic materials bond to the basis metal at temps less than 1250 F.

Coatings have scratch hardness and abrasion resistance reportedly not available in other corrosion-protective coatings.

Allied Porcenell, Inc, 851 S Market St, Waukegun, Ill

Special Cleaning Machine

Machine uses low-flash petroleum cleaning solvents and was designed for bearing manufacturer. Bearing parts, carried through machine and baskets on power-driven roller conveyor, pass through a three-phase cleaning process. Model employs A-F super-spray cleansing system. Solvent filtration is accomplished by tank having two independent screens.

The Alvey-Ferguson Co, 1162 Disney St, Cincinnati 9, Ohio

Variable Speed Motor Control for Lathe

Variable speed control for lathes and other machines is powered by fractional and 1-hp dc motors. The manufacturer states that it has a large short-period overload capacity and will start under heavy load. Price is $197.50 with dc power supply and variable speed control.

Electro Products Laboratories, Inc, 4501 N Ravenswood Ave, Chicago 40

Drafting instrument, called Linemaster, is a plastic disk for use with pencil or scriber point. The 17 slots produce parallel lines 1/64 in., and 1/32 to 1/2 in. from base line in steps of 1/32 in. Each slot is precisely located in relation to circumference of disk to within 0.002 in. of dimension marked on it.

Dri-Flo, 642 E 10-Mile Road, Hazel Park, Mich

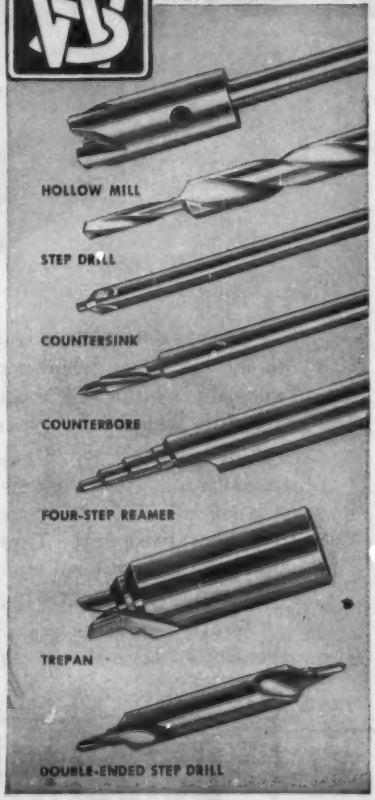
PRECISE MULTIPLE CUTTING . . . WITH ONE W&S TOOL cuts your production costs

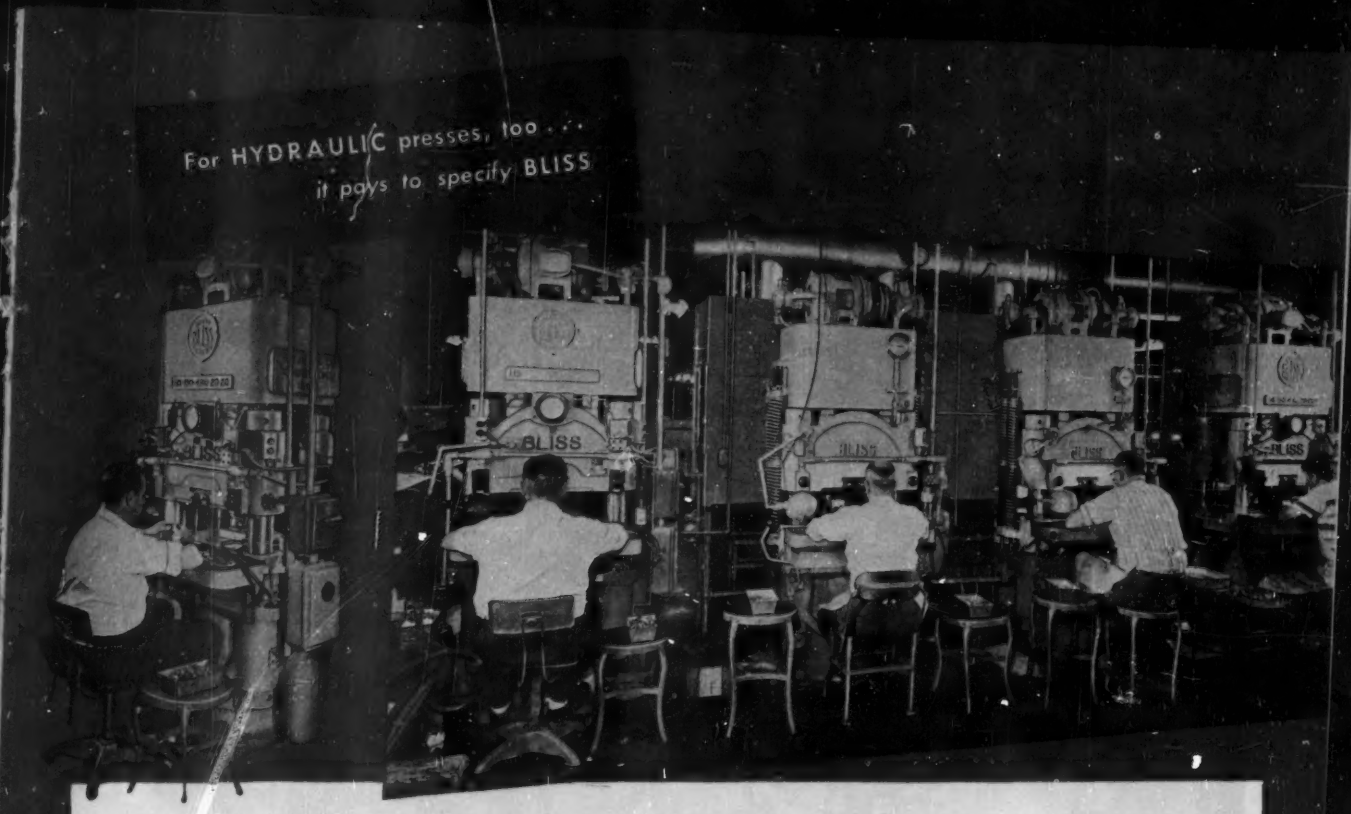
Holes within holes—holes of multiple diameter, intricate profile, and great precision—can be bored in a single operation with a Woodruff & Stokes small cutting tool designed by specialists for your exact requirements. Holes from pin-point to ½" diameter—single or concentric, tapped or reamed, bottomed or through-cut—are made quickly and economically in the hardest metals with W&S tools.

If your production involves the precision machining of very small holes, let Woodruff & Stokes design into one operation a job that may now be costing you as many as five.

WOODRUFF & STOKES CO., INC.
345 LINCOLN STREET
HINGHAM, MASSACHUSETTS

Some W&S Tools ACTUAL SIZE





Gruen obtains MICRO-PRECISION accuracy with

BLISS HYDRO-DYNAMIC PRESSES

Accuracy is the keynote of operations at the Gruen National Watch Case Company, Cincinnati, Ohio. This is especially true in the forming of the case itself. Here, tolerances are critical—with an exact fit of the crystal inside the watch case essential to keep it from falling out. Gruen prefers the Bliss Hydro-Dynamic presses for this job—holding tolerances to several ten-thousandths of an inch.

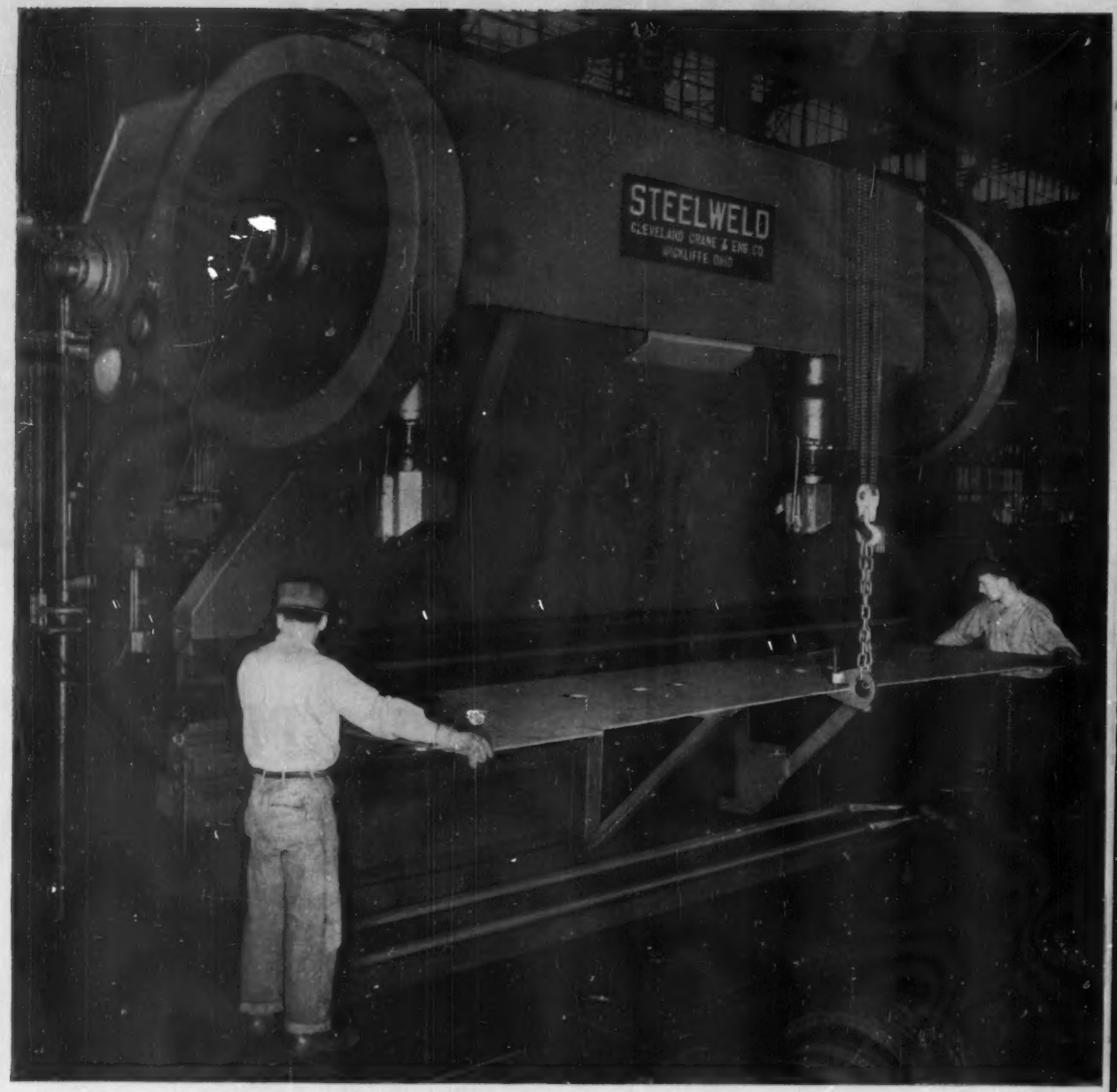
Equipped with high- and low-pressure pumps, these Bliss Hydro-Dynamic presses are the moving-up type . . . especially suited to industries employing sub-die processes. Their efficient, accurate operation is typical of results obtained with Bliss Hydro-Dynamic presses in all types of plants. At Gruen, *72% of the presses are Bliss-built.*

Let Bliss, the world's largest press builder, apply its long experience to *your* next press problem. Talk it over with a Bliss sales engineer. He can help you select the right press for your special requirements. Meanwhile, for more detailed information about Bliss Hydro-Dynamic presses, write for Catalog 30-A.

BLISS on your press is more than a name . . . it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY



Reversing Ram Makes Die Changes Easy

This ruggedly built press is an operator's delight. It is provided with a reversing ram drive which permits backing the ram or upper die away from the work at any point in the stroke.

Since parts are produced in small quantities on this press, the dies and machine settings usually must be changed many times during a day. The reversing ram and other fine features make this work easy and fast for the operators.

This press is rated at ½" x 14'-0" mild steel but will bend plate to 16'-6" long that can clear the 18" deep throat.

No Other Shear Has So Many Important Features

Operators in hundreds of plants all over the country have acclaimed the ease of operation of Steelweld Shears. They like them because they have features that ease their work and make for accuracy. Steelweld is the only pivoted-blade shear on the market. No other shear has the wonderful MICRO-SET knife adjustment. Every Steelweld Shear is provided with fatigue-reducing electric foot switch control as standard equipment.

This shear is rated at 10' x 1".

Inquiries Invited for:

- Shears
- Bending Presses
- Single-Point Presses
- Two-Point Presses
- Four-Point Presses

Single and double action types

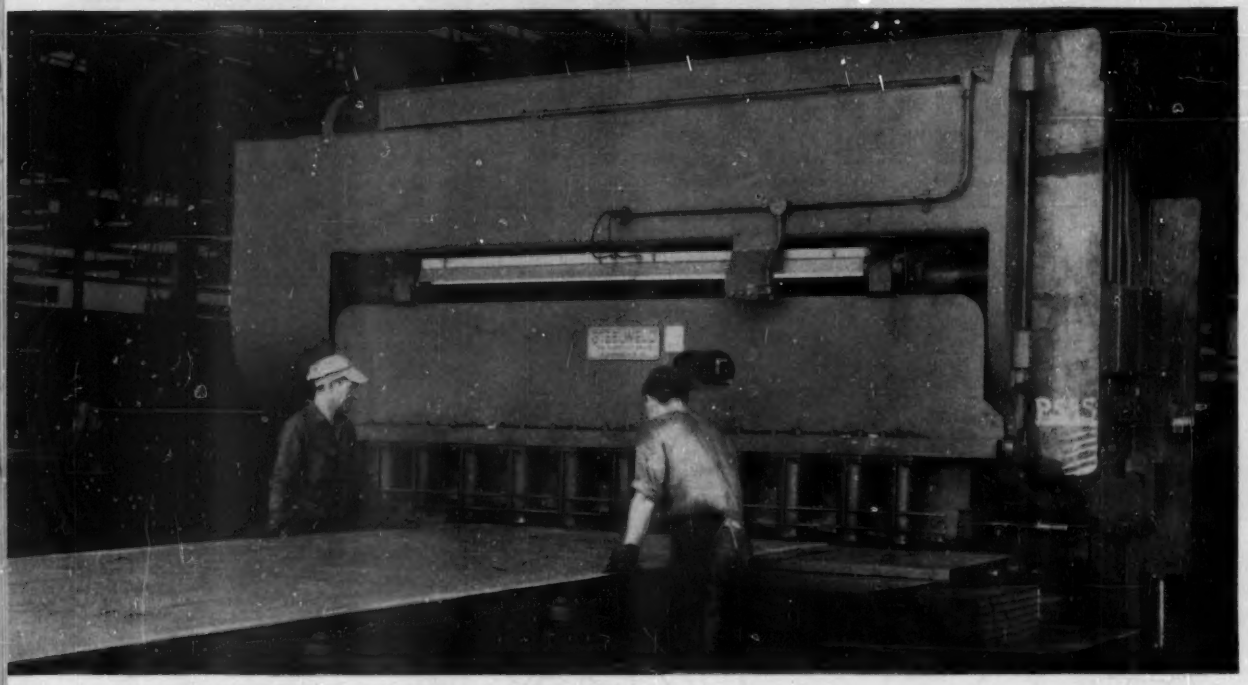
- Air Cushions

Operators LIKE STEELWELD MACHINES

THE MAN who operates a machine day in and day out usually gets to know it pretty well. If he has worked on various make machines, he is in a position to compare. He knows the good as well as the weak points. He can tell you what machines make his job easiest, what produce the most, what require the least maintenance. We have great respect for the operators and listen to what they say.

What we have been hearing about Steelwelds has elated us greatly. Briefly it is this: The operators have high regard for Steelwelds. They like their ease of operation which leaves them fresher at the end of the day. They approve the various adjustments with which Steelwelds are equipped and the simplicity of making them. They applaud the fact that the machines will operate continuously for long periods without need of attention.

The combination of the above factors, namely: Ease of operation, high production, excellent performance, and low maintenance, is hard to beat and accounts for the ever increasing popularity of Steelweld Presses and Shears.



GET THESE BOOKS!

Catalogs No. 1010 (Presses) and No. 1011 (Shears) give construction and engineering details. Profusely illustrated. Sent free.

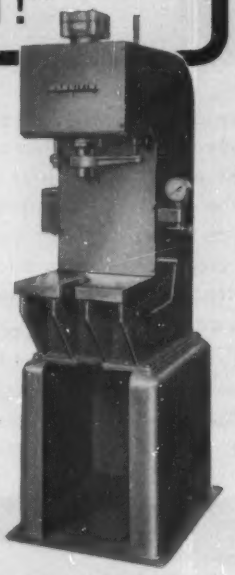
THE CLEVELAND CRANE & ENGINEERING CO.

1458 EAST 281st STREET *WICKLIFFE, OHIO.*

STEELWELD

PRESSES and SHEARS

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois

"I sure love to watch this fellow work—with those BUSTER ALLOY tools!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Tool Control Unit

The Cross tool control unit is now available for all types of metal-working equipment, in four different sizes, with one, two, four, or eight Toolometers which automatically shut down machine when tools need changing. Each has a red area which represents danger zone or last useful period of tool life. Grouping of tool changes reduces downtime and increases production.

The Cross Co, Dept 16P, Detroit 7 Mich

Automatic Wheel Dressing For Centerless Grinders

The new CITCO automatic hydraulic infeed unit provides a completely automatic wheel-dressing, diamond-turning, and coolant-control device. Unit is capable of straight dressing up to superfine dress of 0.0002 in. It has only two adjustments, one for roughing, one for finishing.

The diamond-dressing tool turns automaitcally 3½, 7, or 10½°. Coolant is hydraulically turned on diamond at each dressing cycle.

Cleveland Industrial Tool Co, Inc, Cleveland 17

Cutoff Blades in Mo-Max Cobalt

Mo-Max Cobalt high-speed cutoff blades for cutting harder, tougher steels are said to maintain hardness and abrasion-resistance even at red heat. Tests have demonstrated in over half a million cuts of 8620 and 4140 steel, blades provide more cuts per grind and reduce costs.

Sizes range from 1/16 in. thick by ½ in. high by 4½ in. long to ¼ by 1⅜ by 7 in.

Cleveland Twist Drill Co, 1242 E 49th St, Cleveland 14

High-Strength Common Alloy For Use in Welded Assemblies

High-strength, non-heat-treatable aluminum alloy, K186, has been especially designed for weldability and adaptability to structural applications. Available in sheet and plate form, in a full range of tempers. Standard finishing procedures may be used, and corrosion-resistant anodized finishes applied.

Kaiser Aluminum & Chemical Corp, 1924 Broadway, Oakland 12, Calif

Portable Coolant System

Compact, 1-gal., self-contained unit can be attached to drillpress tables, and other small machine tools and benches. Has flow adjustment from trickle to full stream; pump and motor (operating in oil) are permanently sealed inside of tank.

Viking Industries, Rockford, Ill

MAXITORQ
Overload Release
CLUTCH

minimizes machine Down-Time

AT THE
GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

> "The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.
>
> "Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

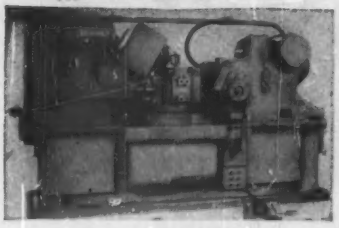
There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

SEND FOR CATALOG NO. AM-12

8CJ53

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Cable Electric Hoist

Cable Quik-Lift electric hoists for heavy production-line work range in capacity from 500 to 4000 lb with a choice of lifting speeds and types of suspension.

Units provide pushbutton control; large, separate load and motor brakes; foolproof limit switch; extra protection features incorporated in safety hooks.

Coffing Hoist Co, Danville, Ill

Small, Portable Die Handler

Portable Model 1016 handles dies as large as 18 x 24 in. It holds top die section by means of clamps permitting operator to reach any screws on top which hold punches or segments.

Die is separated by means of an elevating crank which operates a leadscrew on both ends of the unit. After separation, top section of die may be revolved by a worm and worm gear; hand crank permits revolving 360°.

Hansford Mfg Corp, 1239 University Ave, Rochester 7, NY

Granite Cube Parallels

Matched pairs made of diabase are precision finished on top and bottom surfaces to a tolerance of 0.00005 in. for flatness, parallelism, and the same height over the pair. Dimensions are nominal, with a tolerance of 1/32 in. Extreme hardness is said to provide ten to twenty times the wear life of cast iron.

Rahn Granite Surface Plate Co, 644 N Western Ave, Dayton 7, Ohio

Stall-Design Torque Motor

Reuland torque motors can be stalled or locked, with current on, without motor damage. Unit automatically adjusts its speed to intermittent load changes while maintaining a constant power.

Ratings are measured in foot pounds of torque rather than horsepower. Standard units from ½ through 10 ft-lb, with across-the-line locked service duty of 5, 10, 25, 50 and 100% are available; maximum stalls are 5, 10, 20, 60 minutes and continuous, respectively.

Reuland Electric Co, Alhambra, Calif

Fasteners, diecast, round-head thumb nuts and screws for replacement or adjustment applications have extra-wide head for quick, sure grip. Three standard head dias in four variations: open and closed end thumb nuts, thumb screws with or without shoulders, in all standard thread sizes.

Gries Reproducer Corp, 400 Beechwood Ave, New Rochelle, NY

"J&L 1200"

COLD FINISHED CARBON STEEL

Use "J&L 1200" steel on your tough jobs for

Top— in quality

Top— in machinability

Top— in uniformity

Top— in finish

available in all standard shapes and sizes

It's tops

"J&L 1200" Steel provides the qualities that help machine operators do top-flight work at lower overall costs. With "J&L 1200," the operator obtains: *better machine finishes . . . longer tool life . . . higher rates of speed.* This fact has been proven time and again—in shop after shop.

"J&L 1200" grades meet the compositions published by the A.I.S.I. . . . S.A.E. . . . and Federal Specifications QQS-633.

Try this steel in your own shop. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

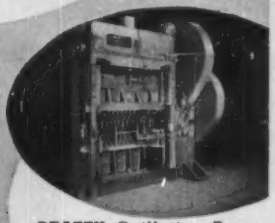
J&L STEEL

Jones & Laughlin STEEL CORPORATION — Pittsburgh

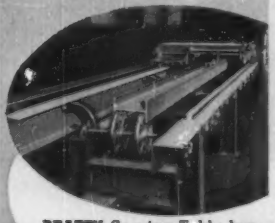
This Beatty Punch CUT COSTS 75%

for a structural steel fabricator

One of our present-day satisfied customers formerly employed machinery using only one punch for punching structural steel shapes. After consulting a BEATTY engineer, this firm installed a BEATTY Guillotine Beam Punch with an adjustable tooling feature that enables them to perform exact repeats of multiple punch patterns in 25% of the time formerly required. Naturally, we can't guarantee such substantial savings in every industrial installation of BEATTY machines! But, if you're currently considering additional production machinery for your metal fabricating plant, better see a BEATTY engineer before making any final decisions! Chances are he'll have an idea or two on how you can achieve greater production economies with BEATTY Machines!



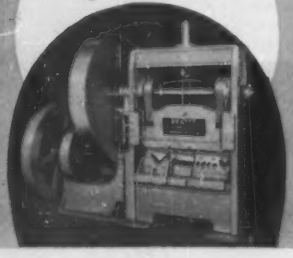
BEATTY Guillotine Beam Punches are available for punching webs and flanges in "I" beams from 6" to 30".



BEATTY Spacing Table handles web and flange punching without roll adjustment.

BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.

BEATTY
Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.



BEATTY
Machine & Mfg. Company
HAMMOND, INDIANA

Metal Forming Machine For Short Production Runs

Roller of hardened and ground steel, with needle bearings, rolls on the outside circumference of wire, strip, channel, or tube to be formed as hand lever is swung around the arbor, assuring a smooth contour bend.

The Curvette forms basic wire up to ¼-in. dia, and multiples of smaller sizes; strip metal up to ¾ by ⅛ in.; and thin-walled tubing to ⅜-in. dia.

Lund Products Div, Artys Sales Co, 11 Broadway, New York 4

Bonney Forge Tools

Hacksaw No. 2625 is designed for use in places where high arch of ordinary units makes sawing impossible. Wobble drive extension No. AT4, AT5, and AT31 provide universal action with ⅜-in. sockets; furnished in 3, 6, and 12-in. lengths. Nut starters, Set No. ZN20, used in places inaccessible to fingers, hold hexagon nuts of any metal, plastic, or fiber. Set contains four double-end starters handling nuts 3/16 to 7/16 in.

Bonney Forge & Tool Works, Allentown, Pa

Cloth belt, 50-in.-wide coated-abrasive Resinwet, in tests on various types of stainless removed stock four times faster than previous methods. Water is used as a coolant.

Michigan Abrasive Co, 11900 E 8-Mile Rd, Detroit 5

Blades for all reciprocating saws available in 17 types to meet cutting requirements for all materials. Fit-Al line incorporates a tang to fit all designs of saws.

Independent Blade Corp, Joliet, Ill

Headscrews, Star Stainless Type 430, have "Bright-and-Shiny" heads, requiring no polishing; substitute for brass, chrome-plate screws for improved appearance at nominal cost.

Star Stainless Steel Screw Co, 699 Union Blvd, Paterson 2, NJ

Hacksaw blade, Truflex hand model, reportedly non-shatterable, is made of HSS in 18, 24, and 32 teeth per inch designs.

Capewell Mfg Co, 60 Governor St, Hartford 2, Conn

Electroplating, Stevco Bright Cadmium Process for iron and steel plating, used with Liquid Brightener, permits easy control, allows immediate integration with the solution.

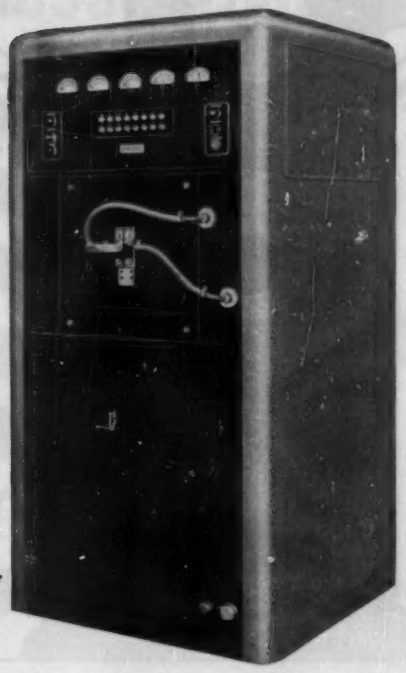
Frederic B Stevens, Detroit 16

To help improve induction heating applications, Lindberg engineers have spent two years developing equipment for M-G set frequencies of 1 kc., 3 kc. and 10 kc. This equipment is now available to you.

This development has also produced many advanced design features that are incorporated in control and heating stations used in connection with motor generator equipment.

Generators are available in power outputs from 30 kw. to 1250 kw.

Lindberg engineers are now equipped to solve your metal heating problems using optimum frequencies for specific applications from 60 cycles upwards. For information consult your nearest Lindberg field office or write for Bulletin No. 1460.



The High Frequency Division of Lindberg Engineering Company announces a complete line of MOTOR GENERATOR EQUIPMENT for all Induction Heating Applications

HIGH FREQUENCY DIVISION
Lindberg Engineering Company
2445 W. Hubbard St., Chicago 12, Illinois

PEARLITIC MALLEABLE CASTINGS

when operating conditions . . .

. . . are severe

If service conditions are unusually rugged and you're troubled by high manufacturing costs—look to pearlitic malleable castings!

Pearlitic malleable has high fluidity that casts easily into complicated shapes. It resists wear under heavy loads at high speeds . . . has high ultimate strength . . . possesses excellent non-seizing properties for bearing surfaces . . . can be given a very smooth finish where desired . . . and can be either liquid quenched or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

So look your product over critically. Then check pearlitic malleable castings. They can replace more expensive methods of fabrication or manufacture . . . can lead to reduced weight, less machining time . . . fewer assembly operations . . . *greater sales appeal for your product.* AA-166

NATIONAL MALLEABLE AND STEEL CASTINGS

M N S C EST 1868

COMPANY
Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

Protecting coating, Rubalt Grade "RA" Black Paint, is a combination of rubber and bitumen; said to be highly corrosion-resistant, requires no primer or pretreatment.

Alfred Hague & Co, 227 - 34th St, Brooklyn, NY

Process timer TSA-21 controls timed simultaneous closing of one electric circuit and opening of another. Time scale of the one-knob control unit is from 0 to 100 per cent.

General Electric Co, Instrument Dept, Schenectady 5, NY

Muffler, Yale Cyclone, eliminates discharge of ignited solids in exhaust gases in gas or diesel-powered trucks. Dry type; does not require water or other servicing.

Yale & Towne Mfg Co, Materials Handling Div, Philadelphia 15

Micrometer, Microfix, has reading in ten thousandths, guaranteed accuracy within 0.0001 in. "Continuous flow reading" eliminates mental arithmetic because each graduation is marked with exact value; minimizes errors due to incorrect adding or parallax reading.

Karl A Neise, 404 Fourth Ave, New York 16

Bearing material operates with or without oil at temps of –120 to +500 F. Contains 40% lubricative solids; ultimate compressior. strength, 22,700 psi.

Booker-Cooper, Inc, 6940 Farmdale Ave, N Hollywood, Calif

Guid-O-Dril, attached to any portable drill, enables inexperienced workers to drill or ream true holes vertically, horizontally, or at an angle in any substance.

High Standard Mfg Corp, Hamden Conn

Drum lifter handles open and closed steel drums in vertical position by crane or hoist; for either high or low ceiling conditions.

Palmer-Shile Co, 16019 Fullerton, Detroit 27

Strapping tape, Permacel 16 Hi-Tack, is available in range of colors. Water and shock resistant.

Permacel Tape Corp, New Brunswick, NJ

Cutters, Utica-Smith pocket armor tools, cut BX and BXL No. 12 and 14-2/3 wire conductor without danger to insulation. The 7-in. long, 8-oz units cut any light, flat metal.

Utica Drop Forge Tool Corp, Utica, NY

Capital Spending Plans for 1955 . . .

Here is Good News About Business Prospects

In 1955, American industry is now planning to spend within 5 per cent of the amount it is spending this year on new plant and equipment. This is the tensely awaited result of a check-up just completed by the McGraw-Hill Department of Economics.

Hundreds of companies, by far the largest number in the eight-year history of these McGraw-Hill surveys, cooperated in the check-up. Combined, they represent 29 per cent of all industrial employment and over 60 per cent of employment in the industries where capital investment is highest. Such a broad cross section constitutes a reliable gauge of the plans of industry as a whole.

PLANS FOR CAPITAL INVESTMENT

	MILLIONS OF DOLLARS			Percent Change
	1953 ACTUAL*	1954 ESTIMATED*	1955 PLANNED	1954-1955
All Manufacturing	$10,026	$ 9,249	$ 8,598	—7%
Petroleum Industry†	4,600	4,875	4,920	+1
Mining	506	380	311	—18
Railroads	1,312	851	769	—10
Other Transportation and Communications	2,954	2,922	2,640	—10
Electric and Gas Utilities	4,548	4,274	4,206	—2
ALL INDUSTRY	23,271	21,784	20,727	—5

*United States Department of Commerce; Chase National Bank; McGraw-Hill Department of Economics

†Petroleum refining, included under both "All Manufacturing" and "Petroleum Industry," is included only once in the total

What is the meaning of these plans, detailed by the table below, for capital investment next year? Is it good or bad news, so far as it concerns the prospect of continuing prosperity? It is to this crucial question that this editorial is addressed.

Key to Prosperity

It is not only good but very important business news that American industry plans to spend in 1955 almost as much for new plant and equipment as it is spending this year. The reason it is important is that a high level of activity in the capital goods industries is universally recognized as a particularly potent ingredient of prosperity for the nation as a whole. A dollar spent for capital goods is spent again and again for wages and materials. Its stimulating effects, called by economists multiplying effects, move through the economy in much the same way that a pebble tossed into a pond creates a widening circle of ripples. This is one reason why there is such intense business interest in the surveys of plans for capital investment.

Here are the principal reasons why the results of the McGraw-Hill survey are a good omen for continuing prosperity:

1. American industry is demonstrating that it does not need the stimulus of war-created shortages, or a rearmament boom, in order to maintain a very high level of capital investment.

The slight decrease now planned for 1955 will still maintain a level only about 11 percent below the all-time peak attained in 1953 under the stimulus of a defense expansion boom.

2. Capital investment promises not merely to stabilize at a high level, but actually to increase as 1955 goes on and thus give renewed stimulus to business.

The level of investment now planned for 1955 by *industry*—manufacturing, petroleum, mining, transportation, communications and utilities—is within 5 per cent of 1954. Contract awards for *commercial* construction—stores, office buildings, warehouses and other service establishments—as compiled by the McGraw-Hill publication ENGINEERING NEWS-RECORD, indicate a substantial increase in 1955. Thus total capital expenditures by *all business* may be very close to this year's total.

Actually, in the fourth quarter of 1954, business capital expenditures, as reported to the U. S. Department of Commerce, are down about 2.5 per cent from the average for the year as a whole. So there is a good chance that during 1955 the annual rate of capital investment will rise above this present level.

Effect of Tax Changes

The plans reported by the McGraw-Hill survey are preliminary plans, reported at the beginning of the period of business budgeting for 1955. As budgets are completed, new projects may bring the total expenditure that is planned even closer to this year's figure and thus make an even greater contribution to continuing prosperity.

But it also cannot be too strongly emphasized that these are plans; they are not accomplished investments. As such they have the vulnerability to changed conditions that characterize any plans.

There is some indication in the results of the McGraw-Hill check-up that one change in conditions recently made by the United States government has had an important stimulating effect on plans for business investment next year. It is a liberalization of the allowances for depreciation. Apparently encouraged by this provision, most of the smaller companies are planning to maintain or increase their purchases of new equipment next year, whereas during the past three years their expenditures have been declining. This is obviously a development that strengthens our economy.

A government insensitive to the key importance of capital investment by business, both in providing prosperity and in raising our standard of living, might easily destroy the present plans. One of the easiest and surest means to do this is excessive taxation of business profits which are the key ingredient of business investment. Whether the extraordinarily constructive program recently enacted by the federal government in the field of business taxation can be sustained remains to be seen. **If it can be sustained, the remarkably cheering plans of business for capital investment in 1955 can readily become firm foundations for a continuing prosperity.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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Whatever way you make them

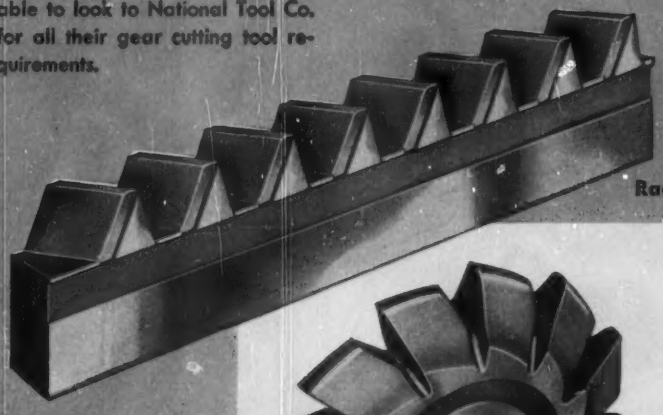
National Tool Co.

can supply the right type cutting tool
because we make *all* types

Gear Shaving Cutters

Hobs

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.



Rack Type Gear Shaper Cutters

Gear Shaper Cutters

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Master Gears

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Representatives in major industrial centers

National
TOOL CO.
Cleveland 2, Ohio

This is the No. 1 place to do business with America's . . .

ABP ABC

SO SHALL YE REAP

. . . and in giant Metalworking *only one magazine* offers so much useful, purposeful information that it attracts the largest all-paid circulation in the history of this giant industry.

With this basic fact as a sound reason, more than 900 suppliers of the products used and bought by Metalworking are again this year investing more advertising pages and dollars in *American Machinist* than in any other metalworking magazine. And as you finalize your 1955 advertising plans, this you can also be sure of:

When you concentrate your advertising in *American Machinist*, you concentrate it where Metalworking's production engineers and executives focus their readership. When you concentrate on selling metalworking production, you concentrate where this industry's buying power is very largely concentrated. And when you *sell* your products to metalworking production through the pages of *American Machinist*, you do so at the lowest cost-per-thousand subscribers of any metalworking publication.

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. . . . . **. . . biggest industry**

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McGRAW-HILL BUILDING, NEW YORK 36
PUBLISHED EVERY OTHER MONDAY
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS
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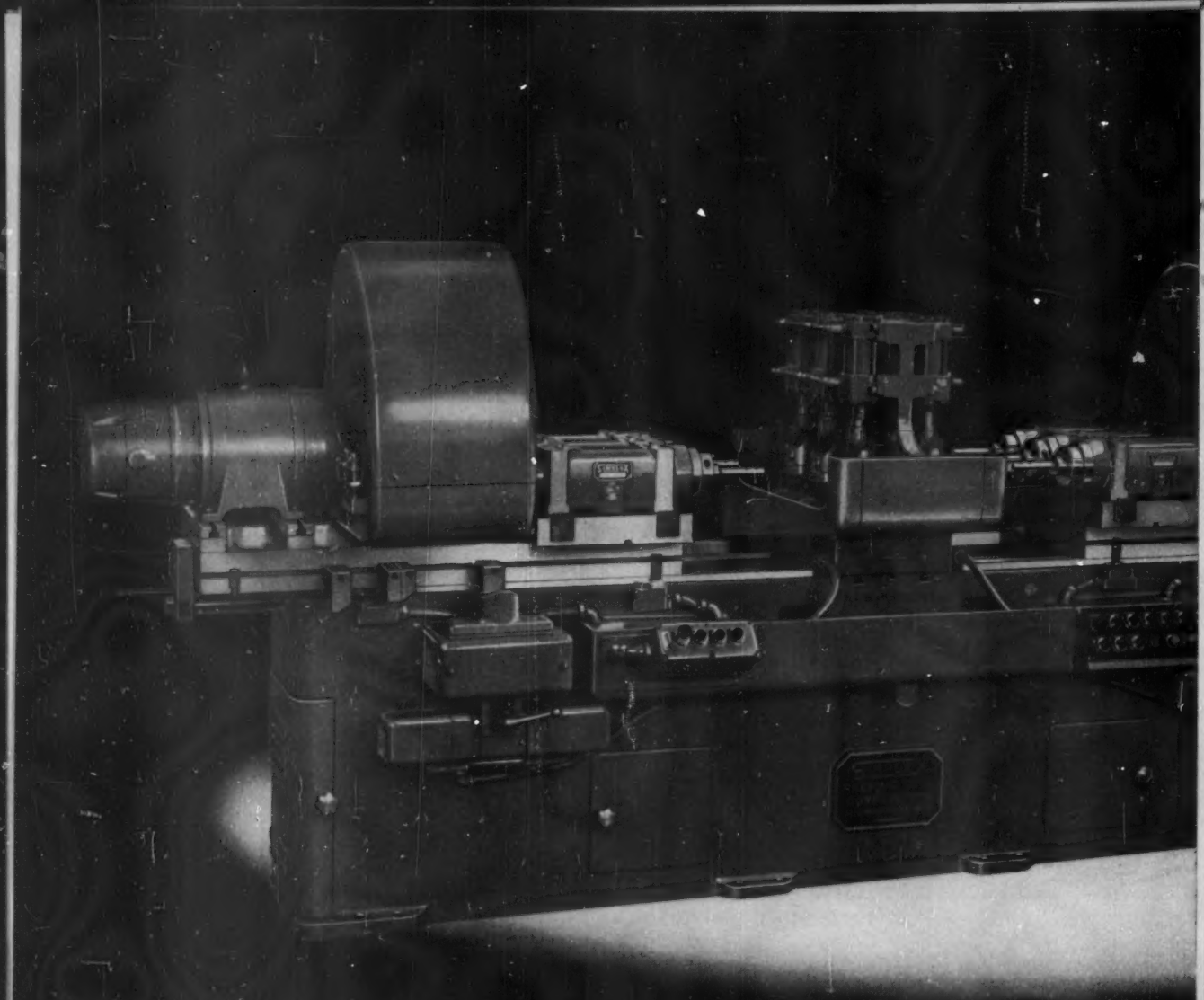

SIMPLEX 2U 2-Way Hydraulic Feed Precision Boring Machine complete with six #2 SIMPLEX self-contained automatically lubricated precision boring heads and a platen type work-holding fixture designed to hold six pistons for semi-finish and finish boring of the wrist pin holes. The electrical and hydraulic system on this machine is made to conform to J.I.C. Standards.

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PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES
SPECIAL DRILLING, TAPPING AND BORING MACHINES

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PRECISION
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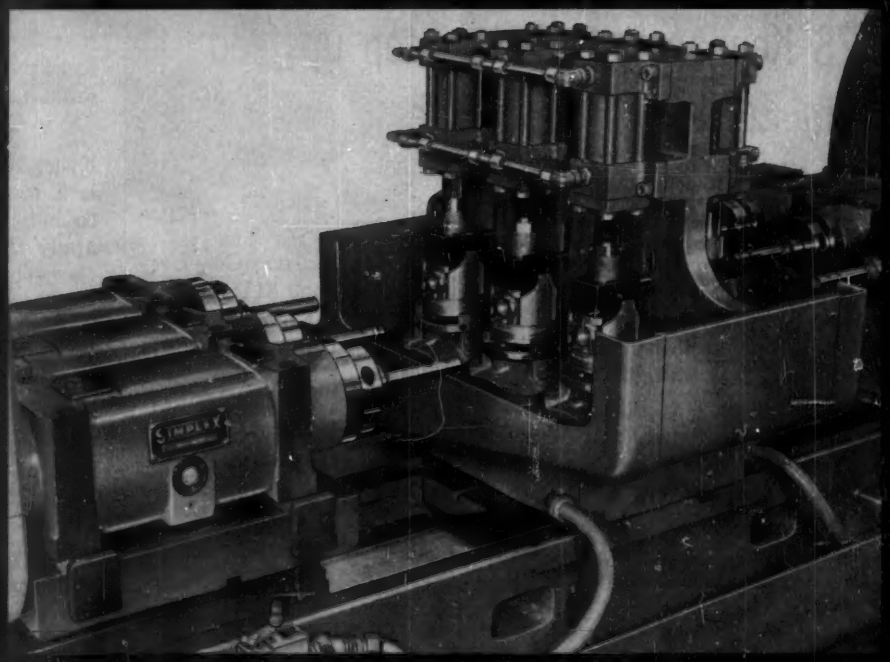
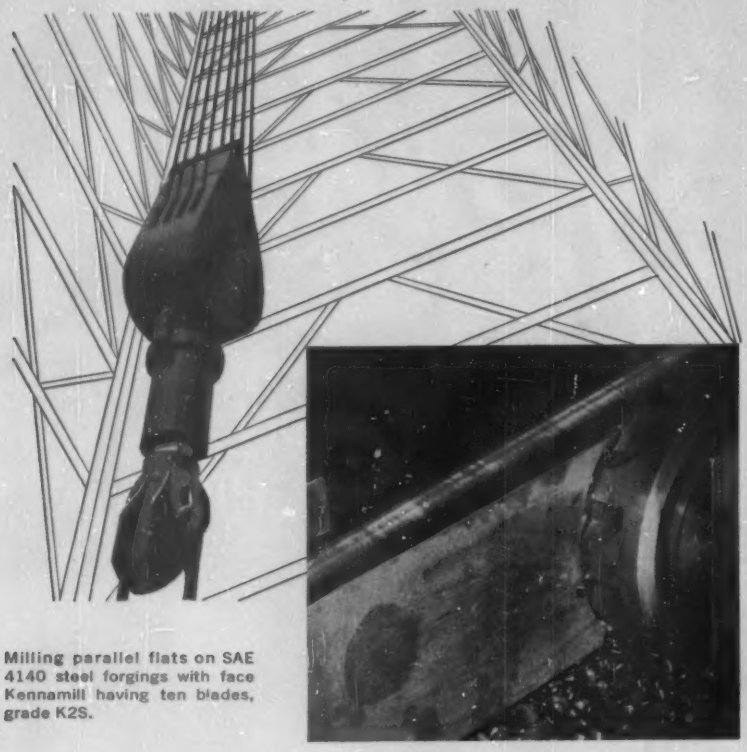


Hydraulically clamped type work-holding fixture designed to hold six pistons. The piston pin holes are semi-finish and finish bored at the rate of approximately 400 per hour at 100% efficiency.

Write for Catalog

K2S—a performance report on another Kennametal grade with ideas you can use to cut machining costs



Milling parallel flats on SAE 4140 steel forgings with face Kennamill having ten blades, grade K2S.

K2S Kennametal* blades step up feed from ¾" to 6" per minute in milling heavy forgings

Using high speed steel milling blades, the Byron Jackson Co., Los Angeles, California, milled tough chrome-moly (Brinell 311) shanks for BJ 350-ton capacity oil well drilling hooks at maximum speeds of 30 SFM. The feed rate on these heavily scaled forgings was ¾ inch a minute. Cutters had to be reground after each pass.

Changing to a standard face Kennamill (10" diameter) with grade K2S blades, this manufacturer of oil field equipment was able to boost spindle speed to 250 SFM—feed rate to 6 inches. Ten or more passes are now made before regrinding is necessary.

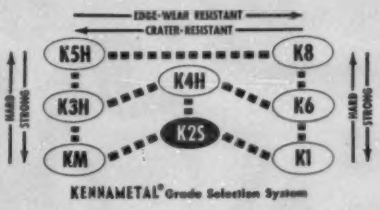
By minimizing downtime and permitting increased operating speeds, Kennametal grade K2S blades stepped up production of these lathes over 800 percent.

*Registered Trademark

Grade Characteristics

K2S is a very strong general purpose grade having good crater and edge-wear resistance. It is widely used in clamped and brazed tools for heavy roughing of scaly, abrasive steel castings and forgings and for interrupted cutting and milling requiring high resistance to shock.

Grade Selection Guide



KENNAMETAL® Grade Selection System

The Kennametal Grade Selection Guide (above) can be used by any experienced machinist to quickly pin-point the exact grade for better tool performance on every machining job. Grades are grouped according to their strength and wear characteristics. The guide shows that K2S is a medium grade for general use—that it is stronger than K4H, has greater edge-wear resistance than KM and more crater resistance than K1.

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Every Kennametal Representative is a tool engineer. He is trained to help you analyze tool wear—apply the right tool and grade to the job—establish proper lathe speeds and feeds—train machinists to get increased production at the lowest possible cost with Kennametal Tools. In addition to his own broad experience, he has available to him the backgrounds of 150 other Kennametal Tool Engineers. His office is listed in the classified telephone directory in principal cities. Call him, or write KENNAMETAL INC., Latrobe, Pa. A-26

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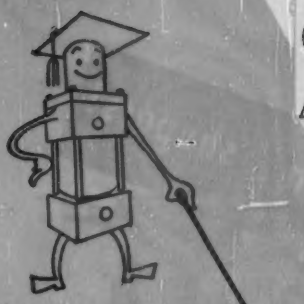
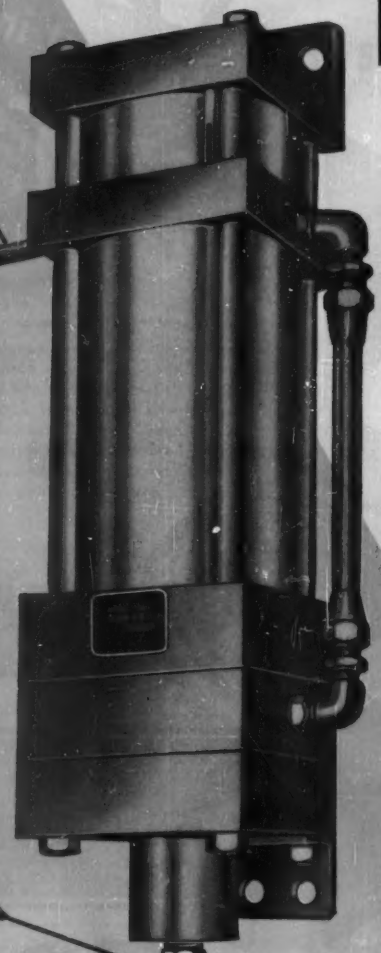


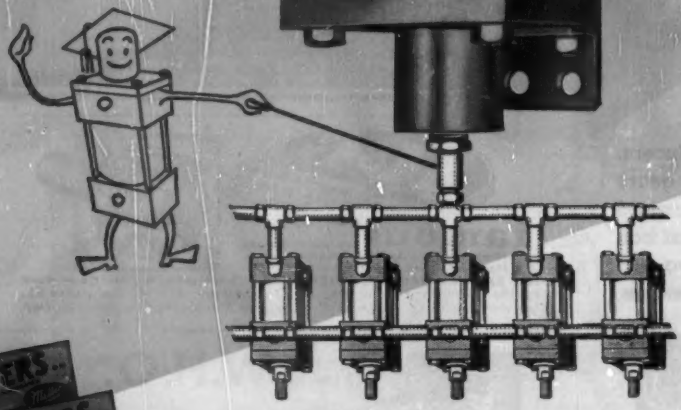
BOOST 80 PSI AIR

Input Range: 40 to 3000 psi Air or Fluid

TO 2000 PSI HYDRAULIC PRESSURE

Output Range: 200 to 10,000 psi Fluid





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Grant Speed Reducers pay off!

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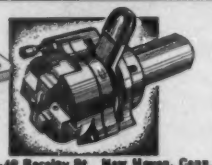
H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 20-40 Barnby St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 324 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

I'm the **W.H.O.*** of

WHO'S WHO

in the precision screw machine products field

Making the finest

COUPLING BOLTS CAP SCREWS
MILLED STUDS SET SCREWS
. . . our specialty

*Wm. H. Ottemiller Co. YORK, PENNA.

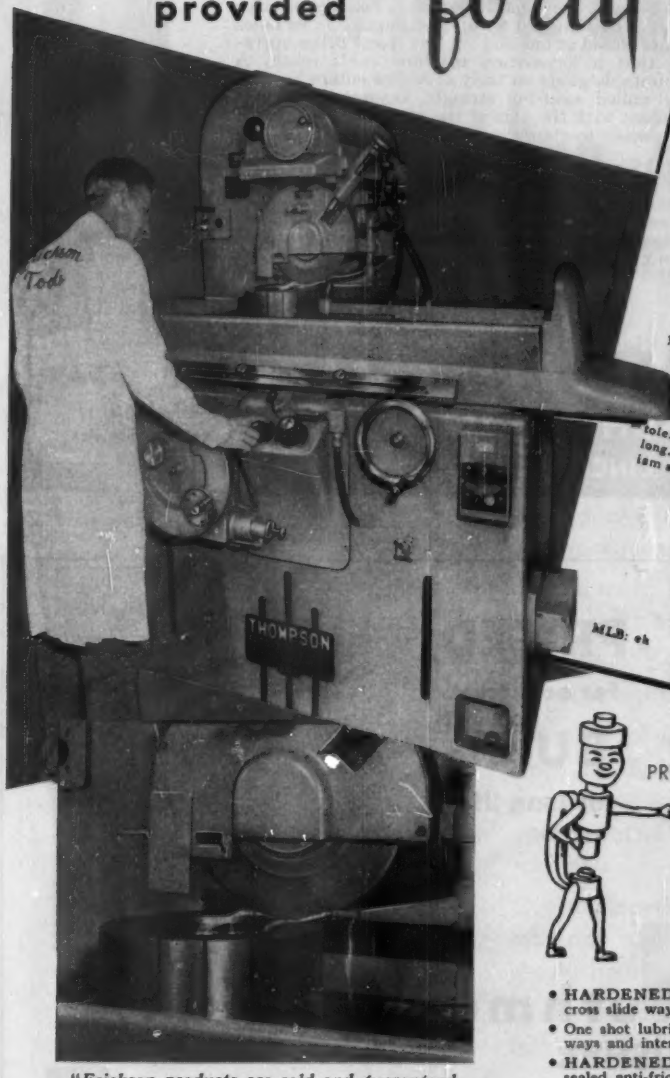
Ottemiller products are sold through Mill Supply Houses and Industrial Distributors.

The Erickson Tool Company

asked for at least .0001 for parallelism and size. . .

The Thompson 2F (8x10x24) Super Precision Grinder

provided "forty millionths"



ERICKSON TOOL COMPANY
EAST 83RD AND HAMILTON AVENUE
CLEVELAND 14, OHIO

September 17, 1954

The Thompson Grinder Company
Springfield, Ohio

Attention: Mr. John Wilson,
Vice President.

Gentlemen:

May we take this opportunity to express our satisfaction with your Thompson 2F 8 x 10 x 24 Surface Grinder.

We purchased this grinder on your claim of .0001 for parallelism size. This tolerance is necessary for most of our work.

Upon its arrival we asked a service man to prove this .0001 tolerance, using 5 blocks on a surface of 4 inches wide by 20 inches long. The test blocks showed .00004 (forty millionths) for parallelism and size. This was well within your guarantee.

Yours truly,

ERICKSON TOOL COMPANY

M. L. Benjamin,
President.

MLB: eh

PRECISION PETE says:

"You may be surprised to find that Thompson 2F Grinders cost less than some others and still provide all these features for greater accuracy and longer service. Fast delivery, too!"

"Erickson products are sold and guaranteed to hold extreme accuracy. It is vital that we have the precision equipment necessary to manufacture these products. Our Thompson 2F Grinder delivers this precision. In the above picture we are grinding a #1200 expanding sleeve and hold within .0001 parallelism and size."

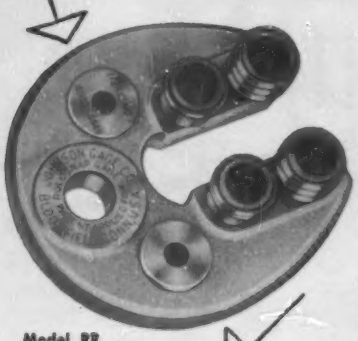
- **HARDENED AND GROUND** cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- **HARDENED AND GROUND** sealed anti-friction vertical slide.
- **HARDENED AND GROUND BED WAYS** with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Handy control panel.
- Elevation micrometer stop graduated in .0001"
- **GROUND THREAD FEED SCREW.**
- Automatic wheel **TRUING** device.
- Longitudinal hand feed with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".

Call, write or wire for estimate

Thompson Grinders

THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

JOHNSON'S new ROLL-Snap THREAD Gage



Model RR

for the utmost in

- ECONOMY
- FLEXIBILITY
- SPEED
- SIMPLICITY

Here is the finest designed ROLL-Snap Gage on today's market. Its huskier, simplified construction actually *lowers* its production cost which means lower prices to you.

Incorporates such exclusive features as precision ground working surfaces on frame . . . all frames, rolls and studs interchangeable . . . Go rolls have restricted end play to detect "drunken" threads . . . Not Go rolls, cone and vee type, correct for Pitch Diameter check . . . lapped steel washers to assure permanent alignment and rigidity of studs. Roll guards optional.

Where more exacting control and information is required, Johnson RING-Snap thread gages or ROLL-Snap and RING-Snap Comparators, Analyzers, and Standard Accessories are recommended.

NEW illustrated literature explaining how to get maximum thread control at lowest costs is yours for the asking.

(Specify Form C-RR-54)

Johnson Gage

THE JOHNSON GAGE COMPANY
BLOOMFIELD, CONNECTICUT

The INSIDE STORY about NATIONAL Keyseating Millers

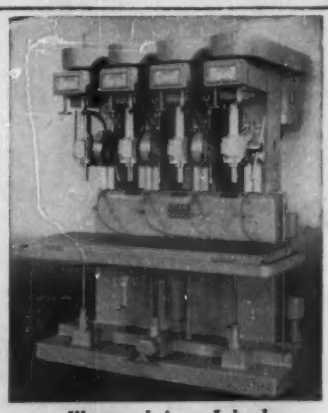
NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations that a keyseating machine can't reach. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed Rockwell hardened steel, accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

PRICED for economy BUILT for long life



Illustrated is a Leland-Gifford No. 3-MVB Four Spindle Drilling Machine equipped with a Ruthman Pump.

Ruthman GUSHER coolant pumps

Based on performance Gusher Coolant Pumps are economical in initial price . . . economical in operation. They give split second coolant flow—use less power when throttled—require a minimum of maintenance. Pre-lubricated heavy-duty ball-bearings and an electronically balanced rotating shaft assembly guarantees long trouble-free life for your Gusher Pump. *Write for catalog today.*

THE RUTHMAN MACHINERY CO.
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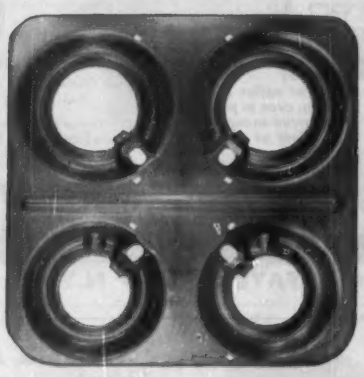
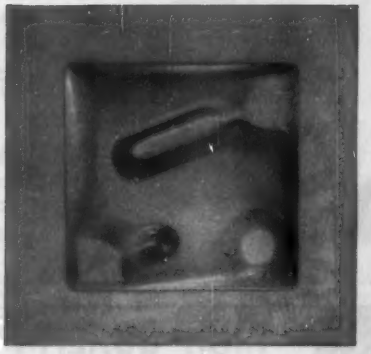
Dies . . . Drill, Welding, and Assembly Jigs





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Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

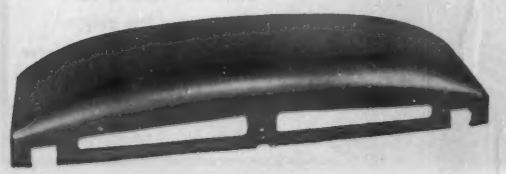
Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

VULCAN TOOL CO. . . . PLASTIC TOOL DIVISION

788 LORAIN AVE., DAYTON 10, OHIO



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Engineering, Processing, Designing and Building Special Tools . . . Dies . . . Special Machines . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size, Vulcanaire Jig Grinders, Plastic Tooling.

This steel crane drum gear and pinions has flame hardened teeth to give extra durability in the best Stahl tradition. It takes years of experience, skilled workmen, and big productive capacity to satisfy industry's exacting needs. Stahl more than qualifies on all counts. Next time, try Stahl!

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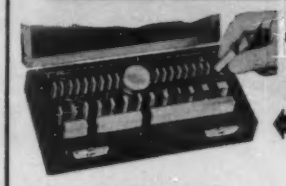

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5 MILLIONTHS ± ACCURACY

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This tool with TUNGSTEN CARBIDE tipped anvils..... $15.75
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Drop-forged model with chrome finished micrometer head from $8.25 up.

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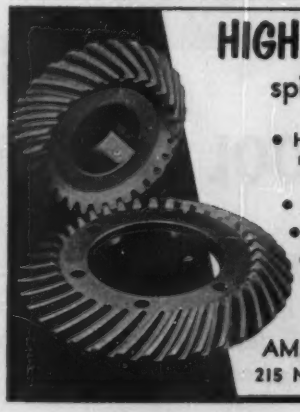

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- Production lots only
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AMARILLO GEAR WORKS
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May your Holiday Joys be Multiplied!

★ With our customers and friends we want to lay aside business cares for the moment and join in spirit to celebrate the joyous Holiday Season.

For you and yours may it be the best ever, full to the brim with deserved happiness and good cheer, and topped with the rich blessings of peace and good will.

To this is added our best wishes for a most Happy and prosperous New Year.

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Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

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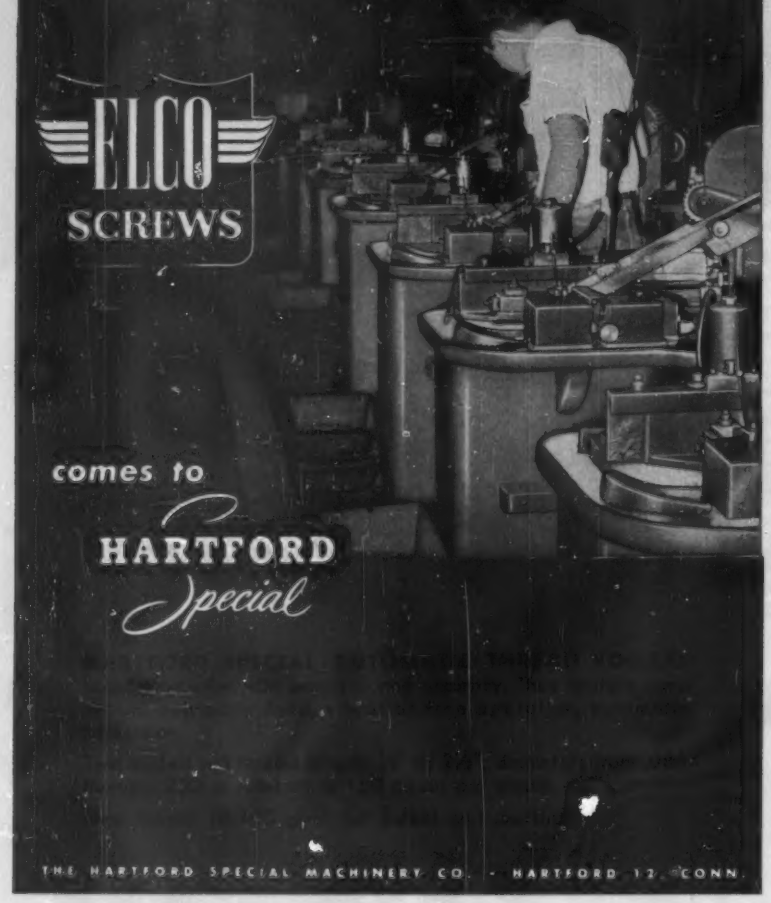
FOR HIGH PRODUCTION THREAD ROLLING MACHINES



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used as standard equipment by leading band-saw manufacturers...

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Part I of a new 2-part *American Machinist* Special Report, dealing thoroughly with the many devices for holding work machined during *rotation*. Sixteen pages, fully illustrated, 25 cents per copy.

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Here, compactly presented in one paper-bound, one-hundred-page booklet, are seven *American Machinist* Special Reports on the nature and application of seven major types of Metalworking tools:

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Identification of the tools in the various classifications, their applications and proper use, care, and important safety precautions are discussed.

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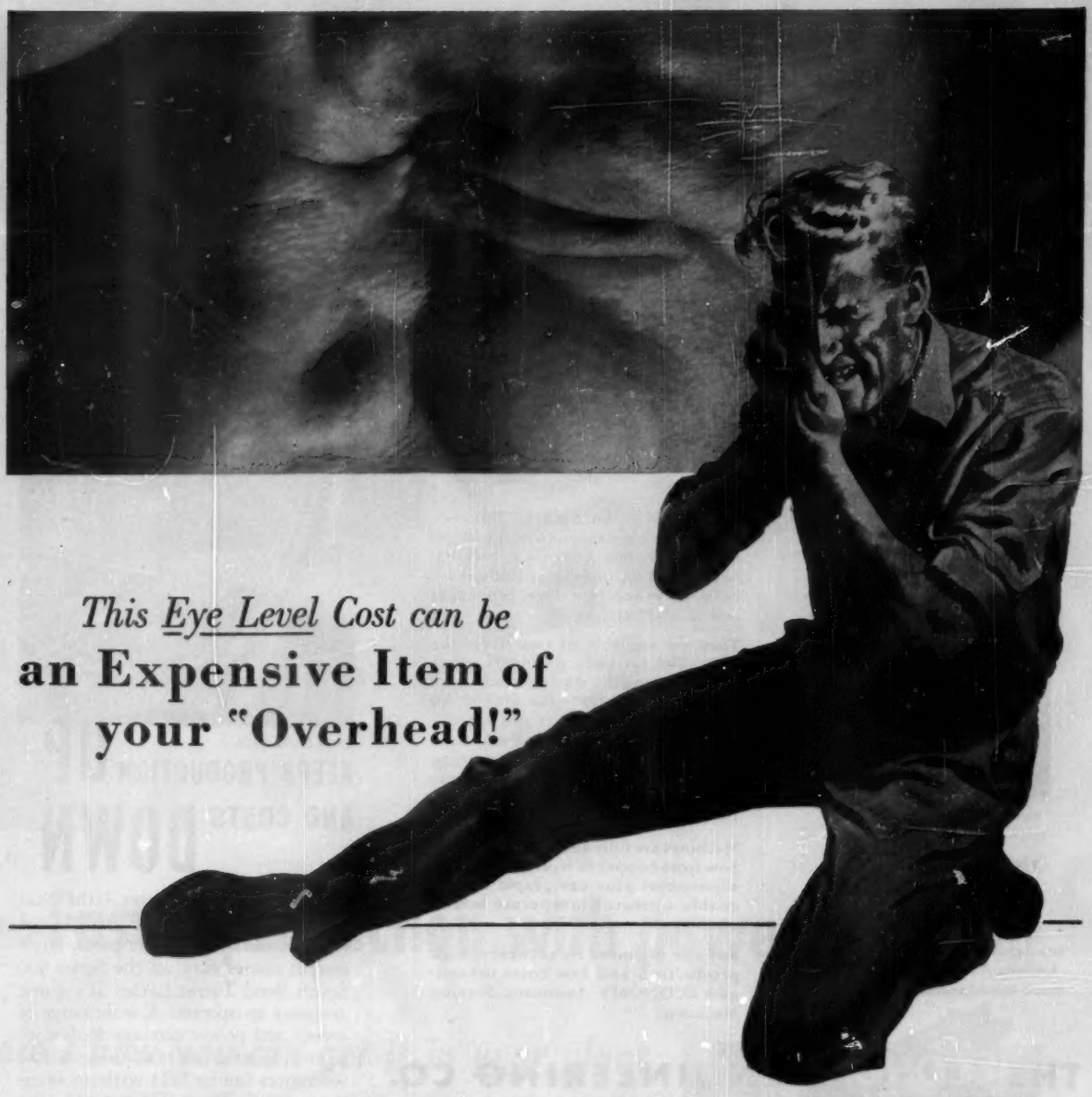

This Eye Level Cost can be

an Expensive Item of your "Overhead!"

No one knows how much a jury will award in an eye accident case, but it's easy to know how much can be saved by an adequate protection program!

Apart from compensation costs which have soared in recent years, and increased first aid and medical expenses, *you'll save:*

1 Lost man hours — very important in a tight, high cost labor market.

2 Idle time of the injured worker's machine.

3 The cost of lowered output of adjacent workers and machines. "I may be next" thinking hurts morale.

4 The cost of increased rejects when substitute workers take over for key men.

What's the cost of eye accidents in actual money? More than $5.00 *per employed worker* per year. What's the cost of prevention? About $2.30 per *exposed* worker when a tested, proved AO Program is installed.

Ask an AO Safety Representative in. Or write American Optical Company, 4132 Vision Park, for free booklet "Improved Industrial Vision." It tells how AO's Industrial Vision Program *cuts* costs, *increases* production, *decreases* accidents.

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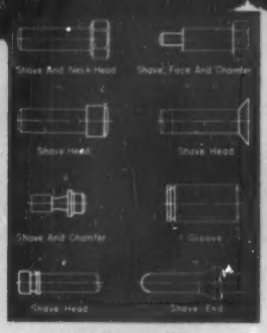
American Optical

SAFETY PRODUCTS DIVISION

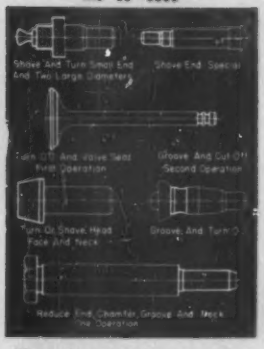
Southbridge, Massachusetts

BRANCHES IN PRINCIPAL CITIES

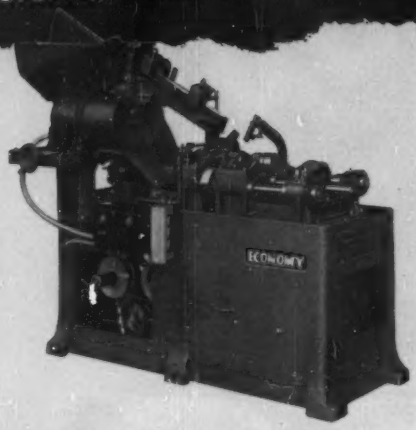
ECONOMY Automatic Shaving Machines
FOR LOW COST, FULLY AUTOMATIC—HIGH PRODUCTION



Typical parts machined on the "LS"-3600


Shave And Turn Small End And Two Large Diameters
Shave End Special
Turn O.D. And Valve Seat First Operation
Groove And Cut-Off Second Operation
Turn O.D. Shave Head Face And Neck
Groove And Turn O.D.
Reduce End, Chamfer, Groove And Neck One Operation

Illustrating operations completed on the S-4300



ECONOMY Automatic Shaving Machines are designed to perform facing, turning, grooving, necking, cut-off and burnishing operations on bolts, automotive valves, projectiles and similar parts.

They are available in two sizes—the "LS"-3600 for body diameters up to 1/2" and lengths under heads from 1/2" through 4-1/2"—the S-4300 for body diameters up to 1" and lengths 3/4" to 6" under heads. Production rates for the standard "LS"-3600 range from 800 to 2400 finished parts per hour and the S-4300 from 450 to 1800 per hour.

Machines are fully automatic and parts flow from hopper to work pan. Simple adjustments plus easy, rapid set-ups enable operator to operate several machines.

For the ultimate in accuracy, high production and low costs investigate ECONOMY Automatic Shaving Machines.

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines
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Double End Automatic Pointing Machines

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WILLOUGHBY, OHIO

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TUBE END FORMING MACHINERY
for
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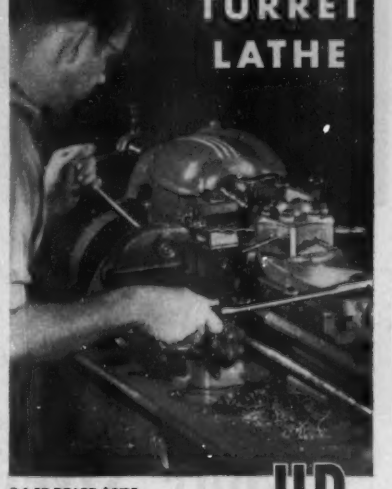
Write for General Bulletin G-3

VAILL *Engineering Company*
137 E. MAIN ST., Rear WATERBURY 20, CONN.

SOUTH BEND
900 TURRET LATHE



BASE PRICE $975

KEEPS PRODUCTION UP AND COSTS DOWN

Here's a precision turret lathe that will help you increase production and reduce costs on precision parts. High output comes easy on the Series 900 South Bend Turret Lathe. It's quick and easy to operate. A wide range of speeds and power carriage feeds contribute to efficient machining. Close tolerances can be held without sacrificing speed. These features make the Series 900 Turret Lathe ideal for second operation work. If you are producing small precision parts, it will pay you to find out more about South Bend Turret Lathes which are made in three sizes: 1/2" to 1" collet capacity, 9" to 16" swing. Write for catalog on Engine Lathes, Toolroom Lathes, Drill Presses and Shapers.

SPECIFICATIONS

Collet Capacity: 1/2". Spindle Bore: 3/4". Swing: 9 1/4" over bed, 3 5/8" over double tool cross slide, 5 1/2" over compound cross slide. Turret to Spindle Distance: 20 5/8". Twelve Spindle Speeds: 41 to 1270 r.p.m. 48 Power Longitudinal Feeds. 48 Power Cross-feeds. 48 Thread Cutting Pitches R.H. or L.H. 4 to 224 per inch.

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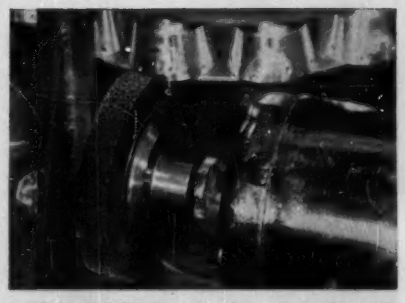
Building Better Tools Since 1906
SOUTH BEND 22, INDIANA

Faster production with power brushing

Here's how you can get it in your plant

AN Osborn Brushing Specialist knows where power brushing fits into the overall production picture. In making an **O**sborn **B**rushing **A**nalysis, he studies all cleaning, finishing and burr removal operations. Then, he analyzes these operations and submits a written report that tells where power brushing could speed production or improve quality.

Such an analysis has resulted in big savings in many plants. It could do the same for you. There is no obligation for an **OBA**. Just call or write *The Osborn Manufacturing Company, Dept. C-27, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



4 TIMES FASTER. *Here, "push-button" brushing with Osborn Master® Wheels removes feather burrs at a rate of 1400 parts an hour. By former hand method, output was 360 per hour. An* **OBA** *can help speed your production, too.*

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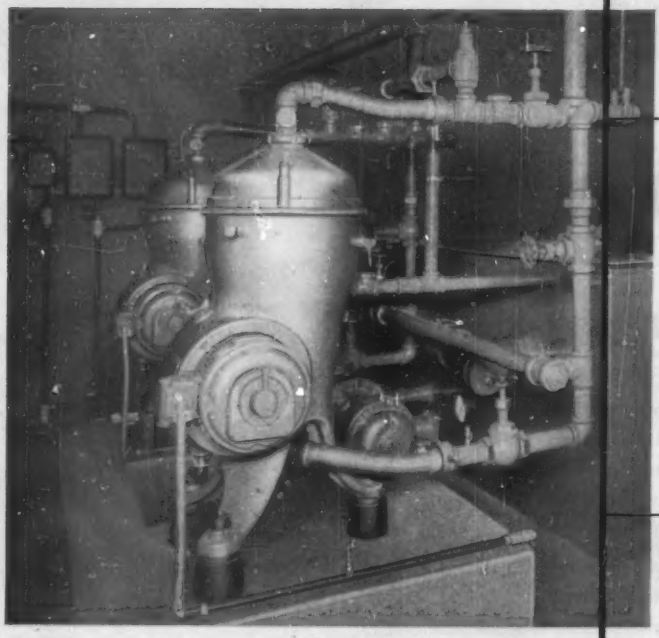
THE ODDS ARE EIGHTEEN TO ONE...

in your favor!

There are eighteen distinct metal working plant uses for De Laval Centrifugals—and every one is either a time-saver, a money-saver, a product improver . . . or all three!

So the odds are all in your favor. There are probably several places in your plant where a De Laval will more than earn its cost . . by making sure that the oils you use will be both clean and dry.

Look over the applications listed below. Check those of special interest to you. Then ask De Laval for complete information . . . today!



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Briquetting Oil . . . Cutting Oil . . . Drawing Oil
Grinding Coolant . . . Engine Oil
Honing Oil . . . Hydraulic Oil . . . Recoil Oil
Lubricating Oil . . . Shock Absorber Oil
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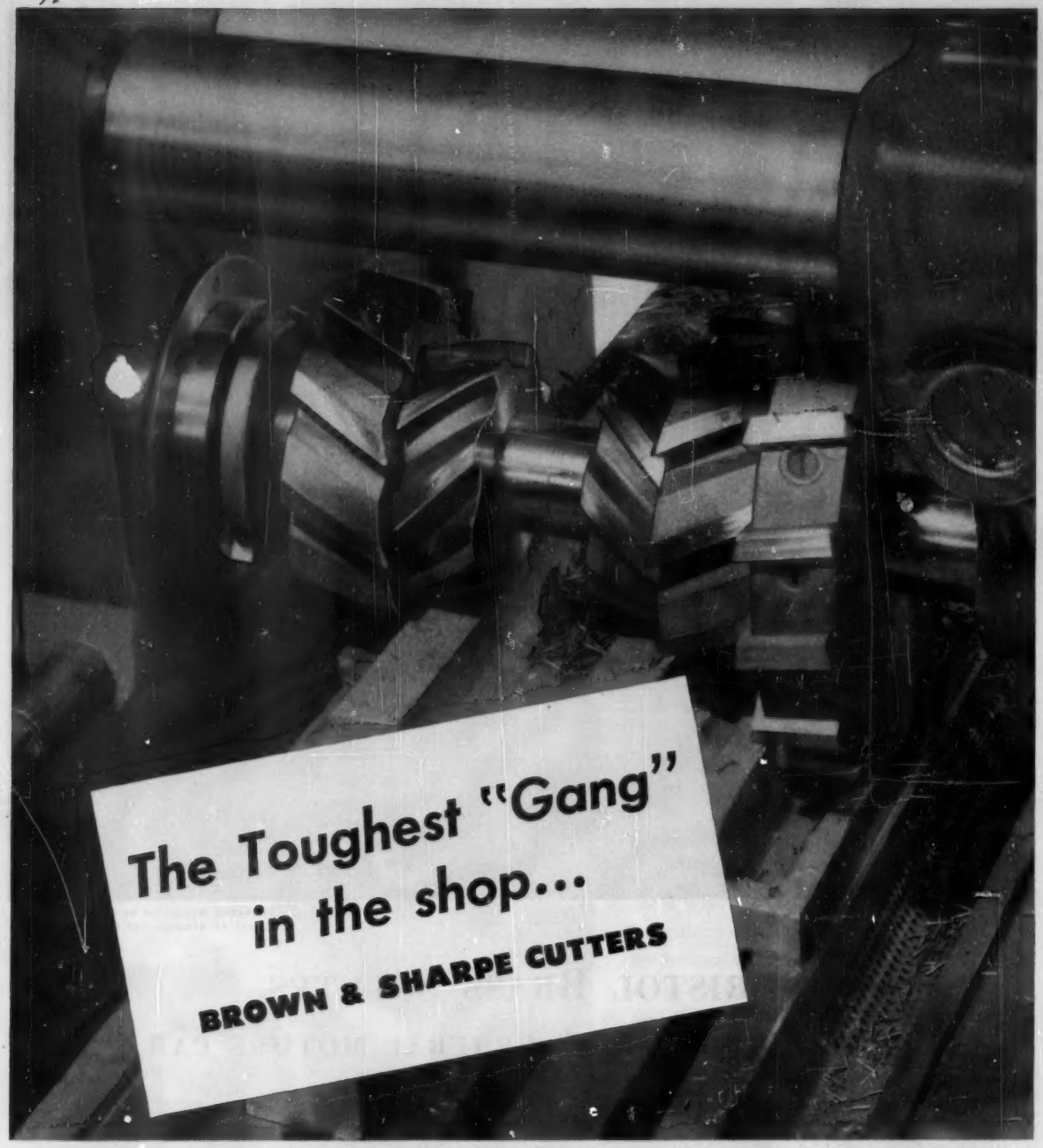

Users everywhere have proven for themselves that Brown & Sharpe Cutters can "take it" . . . that they "stand-up" under the higher speeds and feeds of modern production milling. That's why more shops prefer them. They're expertly made from the finest steels and available in a broad selection of types and sizes, including a complete line of end mills. Write for illustrated Catalog to assist you in ordering.

Brown & Sharpe Mfg. Co.,
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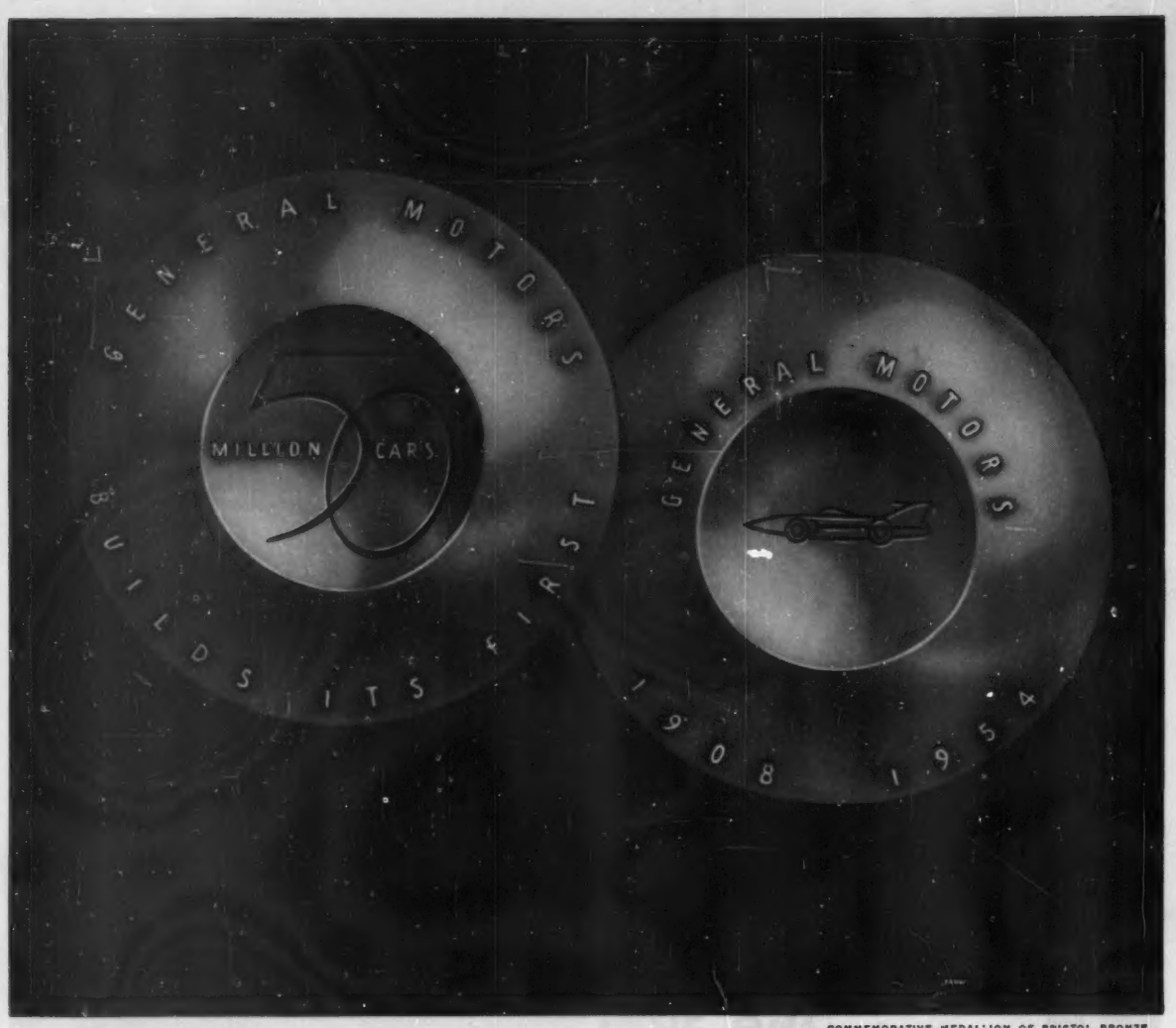


COMMEMORATIVE MEDALLION OF BRISTOL BRONZE. EXECUTED BY MEDALLIC ART CO., NEW YORK.

BRISTOL BRASS SALUTES

THE 50,000,000TH GENERAL MOTORS CAR

It's a giant step from the first General Motors car *(a Cadillac)* in 1908, to the 50,000,000th car *(a Chevrolet)* in 1954. And through the years, General Motors has faithfully built up quality along with quantity, so that today it can be said that "never have so many been offered so much for so little."

So it is a special satisfaction to Bristol to be able to say that there is Bristol Brass in the cooling system of many General Motors cars built today. And it is an added satisfaction to record here, also, the fact that the commemorative medallion shown above is made of Bristol bronze.

To General Motors, on this momentous anniversary, a sincere salute, together with the hope that "the dreams of today will be surpassed by the realities of tomorrow."

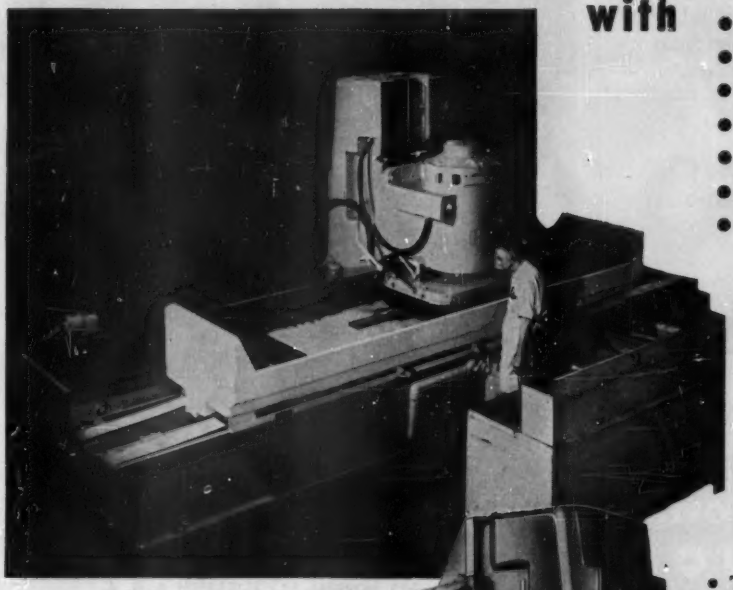
The **BRISTOL BRASS CORPORATION**

makers of Brass since 1850 in Bristol, Conn.

Offices and warehouses in Albany, Boston, Buffalo, Chicago, Cleveland, Detroit, Milwaukee, New York, Philadelphia, Providence, Rochester, Syracuse. The Bristol Brass Corporation of California, 1217 East 6th St., Los Angeles 21. The Bristol Brass Corporation of Ohio, 1607 South Broadway, Dayton 8.

HILL... THE SURFACE GRINDER WITH *all* THE WORTH-WHILE FEATURES

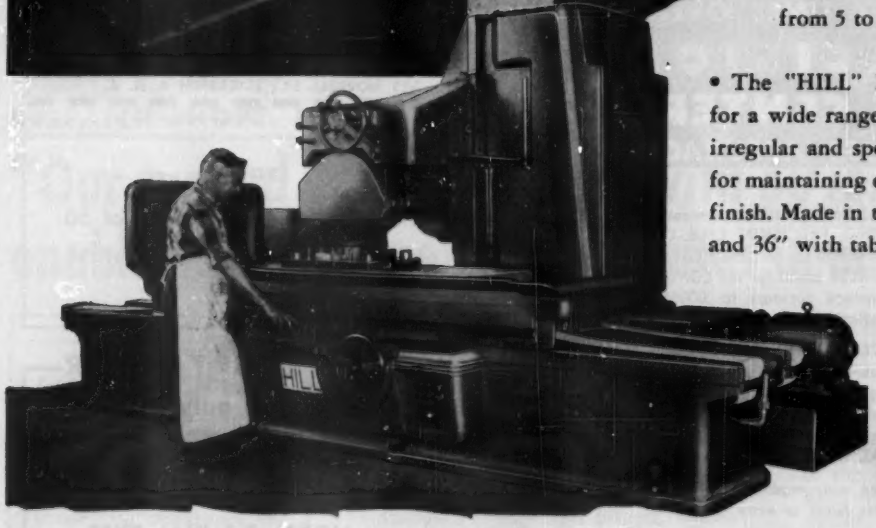
Two types, Horizontal Spindle or Vertical Spindle



with

- *Open Side Accessibility*
- *100% Hydraulic Table Drive*
- *Built-in Spindle Motor*
- *Centralized Assembly Controls*
- *Low Pressure Hydraulic System*
- *One Shot Lubrication*
- *Adequate Safety Devices*

• The "HILL" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces—recommended for accuracy, speed and finish—features that mean increased precision production. Made in table widths of 18", 24" and 30" with table lengths from 5 to 20 feet.



• The "HILL" Horizontal Spindle Grinder for a wide range of grinding—flats, angles, irregular and special shaped surfaces—ideal for maintaining close tolerances with superior finish. Made in table widths of 18", 24", 30" and 36" with table lengths from 5 to 20 feet.

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THE HILL ACME COMPANY

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"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

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MAYES spline gages are carefully controlled as to design, material, heat treatment, tolerance and finish to assure our customers of the best obtainable gage for the part inspected.

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MAYES TOOL CO.

Designers & Manufacturers

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Get every dollar's worth of production from QUADRO PRECISION LIVE CENTERS—designed to support the HEAVIEST load at HIGHEST speed for the LONGEST time! Guaranteed accurate to .00005"—they will outlast dead centers by far!

Each QUADRO CENTER completely eliminates friction—two double row pre-loaded ball bearings absorb combined radial end thrust. You'll discover its remarkable efficiency on a lathe, miller OR ANY OTHER MACHINE TOOL!

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TOOL & MACHINE CO., INC.

New Hyde Park, L. I., N. Y.

"TWO DECADES OF IMPORTANT TOOL PARTS PRODUCTION"

World's Hardest Metal
TOOLS
BLADES
ROLLS
BAR STOCK
DIES
Many times more durable than steel, Talide Metal adds years of life to the wearing edges of tools, dies, machinery and equipment.
Hard as a diamond and almost indestructible, it triples output per man and per machine.
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AND DIES THAT OUTLAST ORDINARY ONES 10 to 1

Made to order for you.

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ACROMARK Company

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Illinois *leads*

Illinois has more metalworking plants of 50 or more employees than any other state: 1,511 such plants in 1953.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

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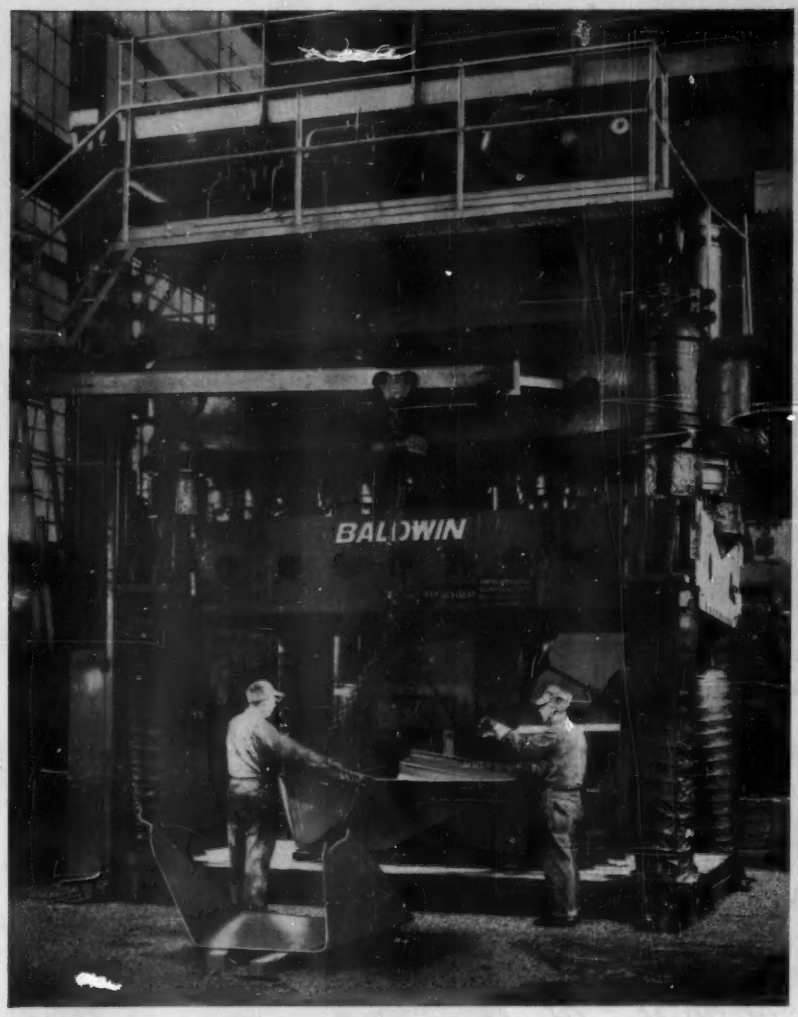
TELEPHONE: JAMAICA 6-4090



THE PRESSING PROBLEM:

In order to press hopper chutes in one operation, Despatch Shops, Inc., East Rochester, N.Y., needed a rugged press with at least 72 inches of daylight.

THE BALDWIN SOLUTION:

This 1,500 ton Baldwin hydraulic press (at left) not only provides 80 inches of daylight but also has exceptional strength and power.

DESPATCH SHOPS, INC., REPORTS:

"Our rugged Baldwin press, *with 80 in. of daylight,* enables us to press hopper chutes in one operation"

What's your pressing problem?

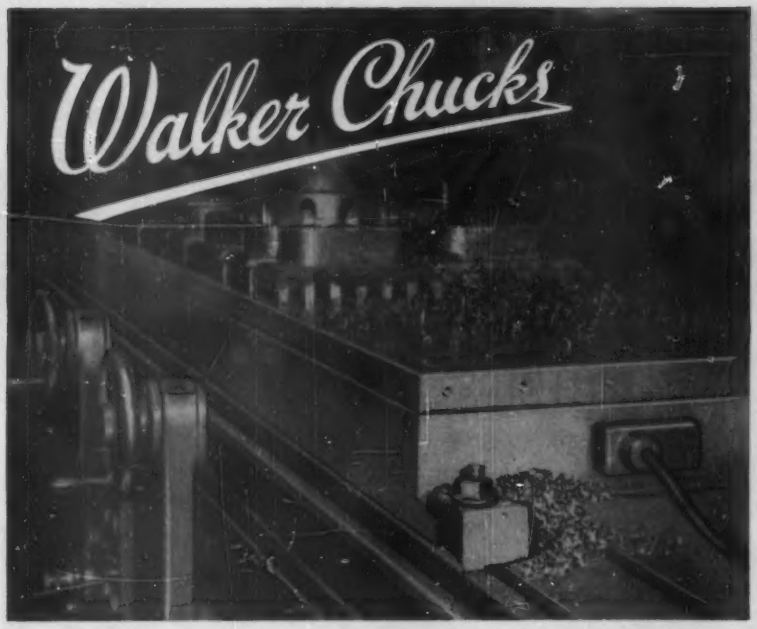
Baldwin-Lima-Hamilton's unsurpassed experience and facilities are ready to help you solve *your* pressing problem. For further facts about B-L-H presses for metalworking, please write Dept. 4402, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Producing hopper car chutes, side stakes, freight car ends and roofs used in the manufacturing of refrigerator and hopper cars, this Baldwin press benefits Despatch three ways:

1. Since its design allows a full 80 inches of daylight, this Baldwin press permits ready handling of very deep shapes such as the hopper chutes being formed in the above photographs.
2. The ease with which this press can be controlled is extremely advantageous because it is necessary for the operator to be able to maintain very accurate control of pressure on the parts being formed.
3. The exceptional strength and power of the Baldwin press is evident particularly in the platens and platen guides. This ruggedness of design helps account for the fact that maintenance costs for the B-L-H press have been negligible.

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities



WALKER special magnetically controlled chuck eliminates magnetization of tool and machine

The unusual feature of this outstanding advance is chip control in milling and planing operations. This powerful special chuck holds for intermittent cuts on rough steel castings using approximately 50% of the available contact are between work and chuck face. Another notable O. S. Walker accomplishment.

Hold Everything with Walker Chucks

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

Save your large JIG BORERS for large jobs... put small precision work on the LINLEY...

The Linley Jig Borer provides the means . . . at very low cost . . . of handling your most exacting requirements in precision. With it you can cut costs through having a tool exactly fitted to your small work . . . save your larger machines for larger work.

Specifications

Table Movement: 6" x 10" Table Size: 7" x 17½"

Send for complete information TODAY!

LINLEY BROTHERS CO.
664 STATE ST. EXT., BRIDGEPORT 1, CONN.

Does jobs no drill can do!
up to 10 Times Faster than Boring!

NEW Clark "HOLE-MAKER"

Totally new—maximum rigidity, no chatter! Roughs or finishes holes to exact size in FORGINGS, CASTINGS, BOILER PLATE, THIN STOCK, TUBING; CROWNED, CYLINDRICAL AND FLAT SURFACES. One of 3 blades is *always* in the cut on odd work shapes—*smooth action even on intermittent cuts!* Use new HOLE-MAKERS in radial drills, drill presses, cutter lathes, portable electric or pneumatic drills, etc. Excellent for trepanning and rough boring I.D.'s in Tubing, Castings, etc.... a real production tool!

Holes can't drift, spindle can't deflect—it's piloted 2 ways!

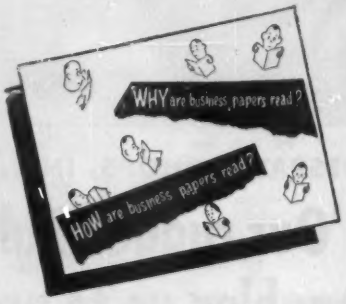
Cuts steels, plastics, transite, non ferrous metals, stainless steel, etc!

5 ADJUSTABLE SIZES: Specify Straight Shank or M.T. 2. 3. 4. Other tapers on order.

Models:	102	203	304	405	506
Capacity:	1" to 2"	2" to 3"	3" to 4"	4" to 5"	5" to 6"

Order from your dealer or write for catalog!

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

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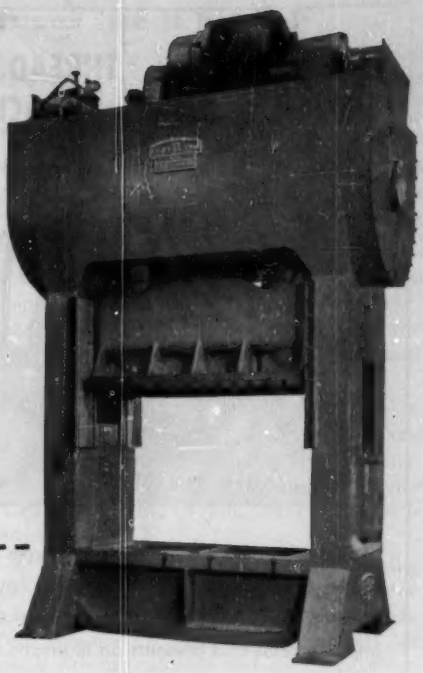
McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

Cleveland S2-350-84-48 Two Point Press, double geared, equipped with Drum Type Friction Clutch, air brake on flywheel and air counterbalance to slide; capacity—350 tons.



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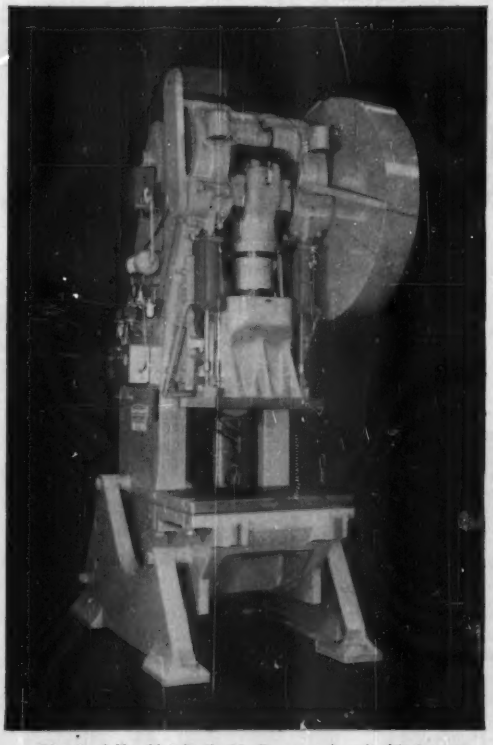
CLEVELAND

designed to your requirements assures utmost production economy!



Cleveland No. 11-I Inclinable Press equipped with Drum Type Friction Clutch, air counterbalance to slide, air brake on flywheel; capacity—110 tons.

We make 11 types of Cleveland presses. Each is available in a wide range of sizes and capacities. You can easily select the exact press for top production efficiency on any stamping job in your plant.

Modern Clevelands are so designed that automatic feeds are easily attached. Our Cleveland Drum Type Friction Clutch and Brake gives you complete dependability, faster control. Let us show you how its patented design cuts operating costs.

Take a look at the production records of your older press equipment. We're sure you'll find that modern Clevelands designed to your present requirements will give you lower production costs. Write or call today.

AA-182

Cleveland S1 Single Crank Press inclined 30° and arranged with automatic double roll feed with by-pass roll lifter, scrap cutter and stock oiler; capacity—150 tons.

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

POWER PRESSES — FABRICATING TOOLS

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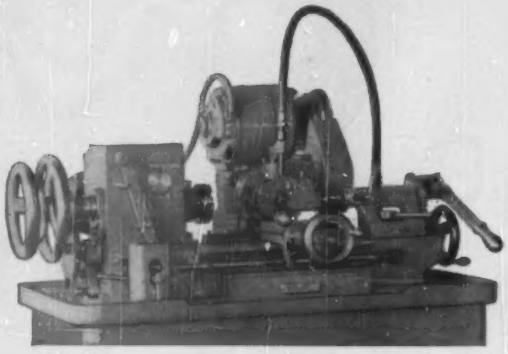
CITY FOUNDRY DIVISION • SMALL TOOL DEPARTMENT

IMPROVED **WALTHAM** THREAD MILLING MACHINES



Several improvements in design have recently been made that are not mentioned in our descriptive bulletin. Send for supplementary sheet that lists these improvements and presents an illustration of the whole machine.

WALTHAM MACHINE WORKS, INC.
HIGH STREET, WALTHAM, MASSACHUSETTS

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"A New Trick For Checking I.D.'s"

- Wide Range
- Multi-purpose
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- Ideal for "O" Ring Grooves

A precision measuring instrument invaluable for speed, accuracy, efficiency and economy. Write for details.

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Special research work to integrate these methods into your automation plans. Complete information available.

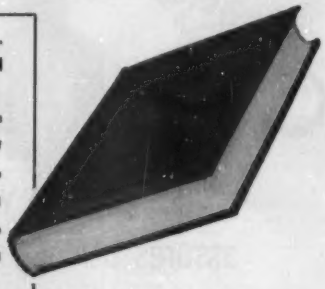
MUTUAL ENGINEERING SERVICE
402 COURT ST. • SAGINAW, MICHIGAN

HOW TO GIVE METAL PRODUCTS THE RIGHT FINISH...

Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP - TO - DATE INFORMATION ON:

—the techniques involved in metal finishing
—the commercial aspects of metal finishing
—the sales value of attractive finishes
—the economics of metal finishing
—the design of parts which require finishing
—new finishing equipment and processes
—metal finishing costs



HERE'S a manual which demonstrates the vital importance of the finishing process in the final appearance and sales appeal of a product and describes each of these processes in careful detail so that you may achieve an attractive finish as efficiently and economically as modern methods will allow. With special attention to improving results and reducing costs, the book covers all types of finish, such as galvanising, polishing, plating, lacquering, enameling and painting—wood grain reproduction, chromium plating, and synthetic enamels, and many new finishes of a specialized nature.

FINISHING METAL PRODUCTS

By HERBERT R. SIMONDS
Consulting Engineer

and ADOLPH BREGMAN
Consulting Engineer, Executive Secretary, Masters Electric Plating Association

Second Edition

352 pages, 5¼ x 8¼, 147 figures, $6.00

The revised edition of this highly useful manual describes many new developments, and incorporates the rapid progress in plastics and synthetic resins. Chapters on coloring metal, on costs and estimates and on organic coatings have been added. Answers to every kind of question which arises in connection with finishing processes are supplied in careful detail, aiming at the most efficient and economical means of achieving a highly attractive finished product with a maximum of selling appeal.

Read this partial list of chapter headings for a few of the important processes and topics described:

- Sales Value of Attractive Finish
- Importance of color
- How to Minimize Cleaning Expense
- Pickling for a Better Finish
- Polishing in Industry
- Designing Products to Reduce Polishing Expense
- Recent Developments in Plating
- Chromium Plating
- Spray Coating
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- Synthetic and Novelty Lacquering
- Enameling and Lacquering
- Coloring Aluminum
- Porcelain Enamel

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Send me Simonds and Bregman's FINISHING METAL PRODUCTS for 10 days' examination on approval. In 10 days I will send $6.00, plus few cents for delivery, or return book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

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The offer applies to U.S. only

this 140-TON horizontal milling machine

There's never been one like it before!

Just a press of a button puts this mighty Schiess into action. A 25-ft. high column moves smoothly along 45-ft. long bedways. Never a vibration—no chatter—even at maximum transversal loads! The new Schiess design of the spindle heads has eliminated this!

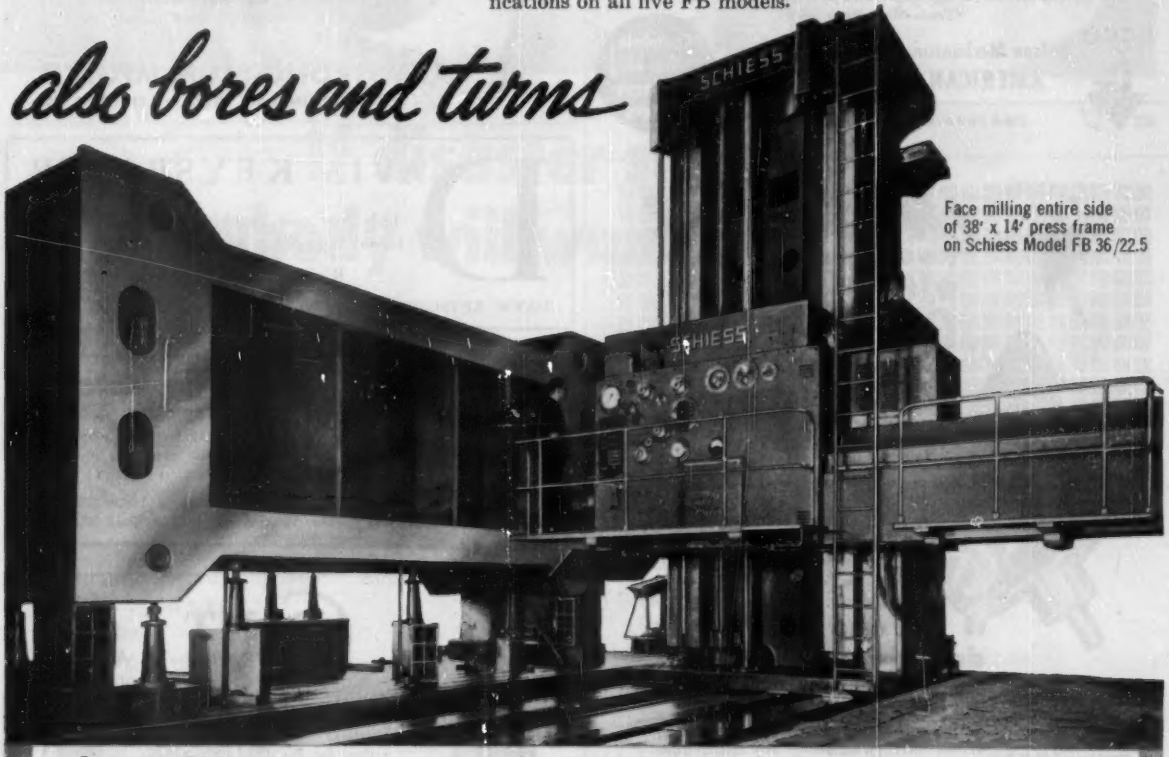
THE MILLING OPERATION. A huge tungsten-carbide cutter in a 14¼" spindle goes to work on the stock. And performs its operation with a consistent accuracy—a surface-finish count—never before obtainable on such a big fellow.

THE BORING OPERATION. Another press of a button! Another spindle goes to work—bores a 79" depth in one cut—or a total depth of 118". Boring and milling spindles are provided with 36 speeds of which the top 12 are V-belt transmitted. Rapid traverse, feeds and manual controls of the two spindles are completely independent.

That this mighty machine has tremendous productive capacity is self-evident. And its productivity goes far beyond conventional milling and boring. Schiess attachments increase its scope to taper-milling, thread-cutting, copying and, in certain instances, copying in 3 dimensions. It's a time saver, too. Can go from feed to rapid traverse immediately, without complicated adjustments.

The Schiess Model FB 36/22.5 Horizontal Milling and Boring Machine is a product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess Engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all five FB models.

also bores and turns



Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

Engineering Division
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Wilson Diamond "Brale"* Penetrators

TO BE SURE of accurate hardness tests use only a "BRALE"*

• A penetration error of *80 millionths of an inch* throws a hardness reading off one full point.

That is why the WILSON Diamond "Brale" Penetrator is required for accurate testing of heat-treated steel on the WILSON "ROCKWELL"* Hardness Tester. It is precision ground under high magnification to assure mathematical and microscopic accuracy Each Brale is accurate to the degree required even for a research laboratory. N Brale penetrators are for use with WILSON "ROCKWELL" superficial testers.

There is a WILSON "ROCKWELL" Hardness Tester for every requirement including the WILSON TUKON for micro-indentation testing. Write for literature and prices.

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Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

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Complete line of Hardness Testers

Cutting-off should be done on a Hack Saw

Any way you figure it—speed, accuracy, squareness or cost — a hack saw will far out-perform a band saw when it comes to cutting-off from bars or billets. As builders of both band saws and hack saws we frankly admit this.

Basically, metal-sawing performance reduces to (1) the cutting-edge, (2) blade speed and (3) feed pressure, just as accuracy and squareness depend on the rigidity and tautness of the blade. In each of these basic factors the hack saw has a wide advantage—advantages which in actual results do average shop jobs as much as 4 times faster and for as little as 1/9th the blade cost.

Write for Catalog showing a complete, modern line of high-performance Metal Saws (Both "Band" and "Hack")

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. • CHICAGO, ILL.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

. . . this FREE catalog

Write today for this PRESS-RITE catalog showing the complete line of presses with capacities from 5 to 85 tons. Ask for bulletin P552. It's FREE!

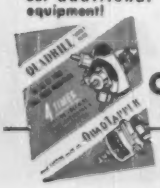
SALES SERVICE MACHINE TOOL CO.
2347 University Ave. St. Paul 14, Minn.

INCREASE your production with 4-POSITION QUADRILLS!

one drill press does the work of FOUR

Drill — ream — countersink and counterbore, all on one drill press without setting up for each operation. A simple rotation of this turret head brings any one of four drills or cutting tools into position. Accurate — fast — economical! Try Quadrill — it will earn you more profit thru less production cost.

Send NOW for additional information on how YOU can increase YOUR production without additional equipment!



CHICAGO QUADRILL Company

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GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

If disaster strikes, everybody will want help at once

Imagine they just dropped an atom bomb.
(And maybe they will tomorrow. Who knows?)
You pick yourself up. You're unhurt.
Must have gone off some distance away.
Lucky that flying glass didn't get you.
Several fires out there in the plant.
Lots of casualties, too. Better get going.
Reach for the phone. It's dead. Well, you might have known.
Ambulances, fire engines, doctors, that's what you need.
And quick.
You've never needed help like you need it now.
But the same goes for everyone else in town.
Thank God Jones made all those people go to the first-aid classes.
Looks like they'll be the only help you'll get for hours.
Thank God they've got plenty of dressings, splints and stuff.
Remember when you got sore at Jones?
("All this stupid first-aid malarkey," you called it.)
Know better now, don't you?
Place looks like a tornado hit it.
Maybe that's what it was?
Whatever it was, better get busy.
There's plenty to do. Thank God you were ready.

Whatever the emergency is—you can be ready for it. That's just good business. Take these precautions TODAY.

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
- ☐ **Promote preparedness** in your community. Your local CD Director can show you how.

Check off these four simple points NOW—it's a matter of life or death.

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$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count 1 line additional.

POSITION WANTED undisplayed rate is one-half of above, payable in advance.

PROPOSALS $1.50 a line an insertion.

INFORMATION

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EQUIPMENT WANTED OF FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns —30 inches to a page. A. M.

NEW ADVERTISEMENTS: Address N.Y. Office, 330 W. 42 St., N.Y., for January 17th issue closing January 3rd.

EXECUTIVE ENGINEER

Outstanding opportunity with well-established manufacturer of heavy precision equipment to head up a well-rounded engineering department of 50 people in all phases, including research and development. Must have 15 years deep experience in heavy machinery design, plus executive responsibilities. Also require a comprehensive knowledge of large machine shop operation.

A qualified candidate must possess excellent administrative ability, a deep analytical sense and high level of imagination and ingenuity, all proved by his record.

Age limits: 42-50. Engineering degree required—ME preferred.

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To demonstrate and sell large pieces of electrical equipment to be attached to standard factory machines. Small, new company, new product. Electro-mechanical experience or engineering background desirable. Write stating general qualifications:

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One 12" 8-spindle, type "D" Bullard "Mult-Au-Matic" arranged for double index, with at least 2 double purpose heads and 2 compound heads.

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Have two (2) Grinders #18, with 36" and 42" Chucks. Send drawings for quotation.

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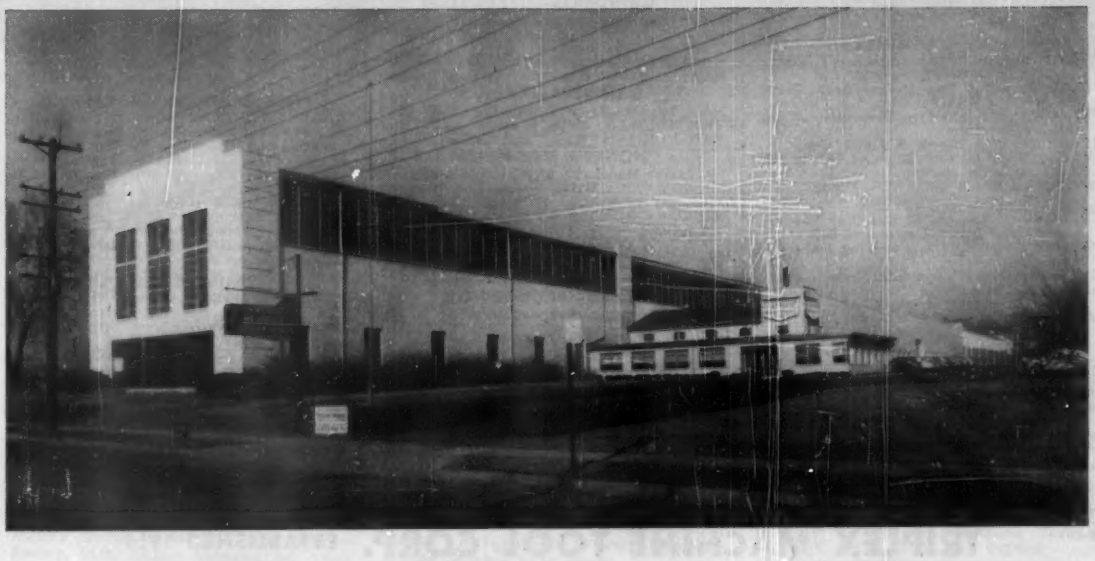

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75 H.P. LaPointe Hydraulic Broach, m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke Single Ram Vertical Surface LaPointe, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dual Ram Surface Hydr. Broach
Oilgear Hydraulic Broach, type XA, 54" stroke, m.d.

RADIAL DRILLS

2'-9" col. Fosdick, m.d.
2½'-10" col. American Triple Purpose Plain, m.d.
3'-9" col. Cincinnati-Bickford, m.d.
3'-13" col. Cincinnati-Bickford Super-Service, m.d.
4'-11" col. Morris, m.d. on arm
4'-13" col. Cincinnati-Bickford Plain, m.d.
5'-14" col. Carlton, m.d.
6'-17" col. American Triple Purpose Plain, m.d.
7'-16" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box m.d.
8'-19" col. Cincinnati-Bickford Super-Service, m.d.
Zewo Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 15 Buffalo Floor Model, m.d.
No. 18 Canedy Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2, 3 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 4 Fosdick, 8" overarm, belted m.d. No. 2 Taper
1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
No. 2 LMS Leland-Gifford single spindle, High Speed, m.d.
2 spindle Avey size No. 1 type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3 belted m.d., p.f. overhang, m.d.
2 spindle #2 Leland & Gifford High Speed, 8" overhang, m.d.
3 spindle Leland & Gifford #1LMS—High Speed, late, m.d.
3 spindle Leland & Gifford High Speed Model 3MS, m.d.
4 spindle Allen High Speed, m.d.
4 spindle Leland & Gifford High Speed, m.d. on each spindle
6 spindle Leland & Gifford, m.d. on each spindle, No. 2 Taper
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper

HORIZONTAL DRILLS

3 way Natco Horizontal Drill, consisting of 3 E13 Holeunits
No. ½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. ½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
Special Horiz. Drill. Machine, Cinti. Bickford Head Mounted horiz. on base
Model 410 W.F. & John Barnes 2 spindle Hydraulic Deep Hole Drill, m.d.
2 spindle Baush Horiz. Deep Hole Drill, m.d., 6½" swing

AUTOMATICS

⅞" Cleveland Model B, belt
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
No. 8A Cleveland, m.d., 8" cap., latest
Model B—1-1/16" Cleveland, m.d.
4 spindle 1⅝" Cleveland Model M, m.d.
No. 5 DELX Potter & Johnston, m.d., late
Model A—1⅜" Cleveland Single Spindle, late
Model A—2" Cleveland Single Spindle, late
2½" Cleveland, m.d.
Model A—3⅜" Cleveland Single Spindle, late
No. 6DRELX Potter & Johnston, m.d., later type

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅞" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type
No. 326 Oster Bolt & Pipe Thread Machine, m.d.

HORIZONTAL BORING MILLS

3A Universal Horizontal Boring Mill, m.d.
25T Giddings & Lewis, m.d., late
No. 32 Lucas, m.d.
Barrett Double End, 7" and 5" spindles, m.d.
5½" bar Betts Floor Type, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers Floor Type, m.d.
54"x11' Rectangular Table, 40" high
Floor Plate 6'11" wide by 9'1" long x 9½" thick, 6 T slots
Floor Plate 48" wide x 22' long x 7" thick, 4 rows T slots
Pair Floor Plates 32" wide x 18' long x 10½" thick
No. 410 W. F. & John Barnes Horiz. Boring & Drilling Machine, m.d., late

VERTICAL BORING MILLS

36" Bullard, m.d.
42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
42" King, with side head and plain swivel head on rail
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
100" Niles Heavy, m.d., p.r.t.
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.

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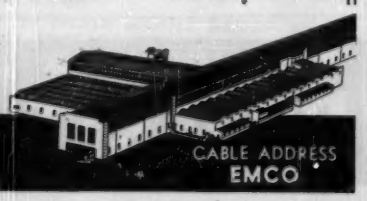

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1941-1954 MACHINE TOOLS

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle, 8" overhang
ALLEN: #2½ High Speed 15" #3 M.T.
BARNES: No. 210, 2-spindle, 21" Swing
PRATT & WHITNEY: ⅛B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR MACHINERY
FELLOWS: 61A & 64A Shaper, 18" dia.
FELLOWS: #61 Gear Shaper 36" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)
INTERNAL GEAR GRINDER, GG-31

GEAR TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 2 Bevel Gear Tester
GLEASON No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GEAR HOBBERS
CLEVELAND: #130 & 140 Rigidhobbers
REINECKER 60"
BROWN & SHARPE No. 44 20" cap.
LEES BRADNER 49A

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 cap. 6"x18" plain
CINCINNATI: 6"x18" Hydraulic, Plain
LANDIS: 16"x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 12"x18" Type C. Universal
NORTON: 10"x36", 30 Deg. Angle Wheel
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Spines
GLEASON: #17, 23½" P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL
BRYANT: No. 5, 5Y, 16-16, 16-CP-16, 16-28, 24-L-36
HEALD: #50 Planetary
HEALD: #72A3 Sizematic
HEALD: #72A3 & #72A5 Extended Bridge

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½" Un. Radius

HONING MACHINES
BARNES: Model 172, 2" dia. x 6" stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES—PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
POTTER — JOHNSTON: #4D Auto Turret

LATHES—TURRET
BULLARD: 36" Vertical turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new

LATHES—TURRET—*continued*
WEBSTER & BENNETT: Vert. 36" & 48" (New)

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
MARVEL: No. 6A Hacksaw, 6"x6"

THREAD MILLERS & TAPPERS
HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 12½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ¼" to 2¼" dia. capacity.
NATCO: 16 spindle Tapper ⅝" cap.
PRATT & WHITNEY: Model C 4½x12" Thread Miller

MISCELLANEOUS
GARDNER: Model 84A Double Disc Grinder, 23" Wheel
MOLDING MACHINES, ROLLER JOLT: Osborne Model 2047-3
AUTOMATIC SCREW MACHINE, Wickman Single Spindle, 7/16" New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½" & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
HARDNESS TESTER: Grogan Brinell, 16-8
SHEFFIELD: Precisionaire Gauge
SUNDSTRAND: Double-End, #88, 42" & 60" Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

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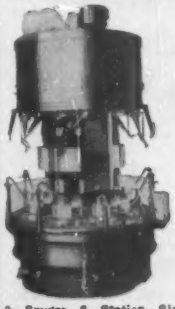

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BULLARD MULT-AU-MATICS

Slides Equipped with Std. Universal, Cross Compound Heads and Plain Vertical Heads

2—Type D 12" 8-spindle S/N 22157 & S/N 16878 with Standard chucks—30 HP motors
1—Type D 8" 8-spindle S/N 15010 with Std. Chucks
1—Type D 8" 8-spindle S/N 15170 with chucks 25 HP motors

ALSO AVAILABLE FROM STOCK

V-8 CRANKSHAFT MACHINERY

2—Wickes Model MF-4 Heavy Duty Automatic Single Spindle Multiple Crankpin Turning Lathe S/N 7100-1-2. 19.7 Machines complete with Motors and Controls.
3—C.F.B.-4-F Milling Pin Bearing Lathes S/N 346, 347 and 389. 1944 Machines Complete With Motors and Controls.

2—Snyder 6 Station Single End Hydraulic Re-centering Machine S/N 10347. 1946 Machines complete with Motors and Controls.
2—#2L.B LeBlond Double Center-Drive Automatic Crankshaft Lathes S/N 2 L.B-30-34. 1947 Machines Complete with Motors and Controls.
1—V-8 Landis Crankshaft Pin Grinder 16x32", single wheel, S/N 16411; 3 motors & controls.

GEAR EQUIPMENT

7—Fellows Model #7 High-Speed Gear Shapers S/N FS168, FS196, FS234, FS249, FS262, FS263, 13237.
1—Cleveland Model #220—3 spdl. Hobber S/N 86-662.
1—Fellows Model 7S High Speed Gear Shaper S/N 15418.
2—Fellows Model 725A High Speed Gear Shapers S/N 18714-19201.
3—National Red Ring GCC 8" & 12" Gear Shavers S/N 170, 334, 100.
1—Cross #41 Duplex Chamfering Machine S/N 578
1—4T Fellows Thread Generator S/N 11012.

NUT TAPPERS

4—⅝" National Bent Shank Nut Tappers
2—⅞" National Bent Shank Nut Tappers

GRINDERS

No. 2 Oliver Arc Face Grinder, cap. 6" to 20", S/N 2C-307 (1948) Machine equal to new.
1—2-spindle Besley Vertical 36" grinder S/N 2028 automatic sizing. Hydraulic Index Table
No. 2 Cinn. Tool & Cutter Grinder S/N 1D2T1P-43 (1946) Machine equal to new. Has complete tooling.
Do-All Surface Grinder, Model G-10 S/N 43510 with 8x24" Perm. Mag. chuck. Completely rebuilt.

CHUCKERS

2—Baird Mod. B Chuckers, 6 spdl. 7" cap. rear slide

DRILLS

2—HO Baker Drills #4 MT—S/N 11601, 11602
1—36 HO Baker Drill, 15 HP Motor.
1—Hammond Opposed Head Drilling and Reaming Machine. 10 Station Index S/N 67.

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27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type. 1942.

24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

24", 36", 42" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing, M.D.

No. 2, No. 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.

24"x10' AXELSON Geared Head, Heavy Duty Model "E" 28" Actual Swing, M.D. Taper Attachment. 1942.

No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head, Late Type.

12"x18" LIPE-ROLLWAY Semi-Automatic Carbo-Lathe, M.D., 1945.

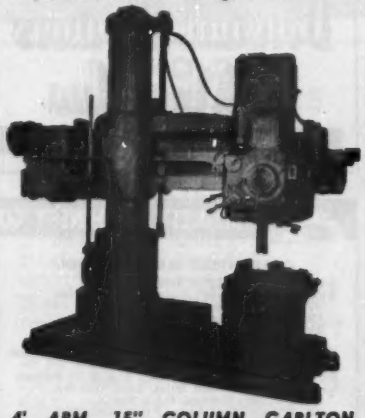
DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel. 1941.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive. Late Type. 1943.

No. M200 DEFIANCE Prod. Drill, 2" cap., #5 M.T., 26" swing, 1942.



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

MILLING MACHINES

#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2 BROWN & SHARPE Vertical Mill, light type, swivel head, M.D., late

96" x 86" x 28' NEWTON PLANER TYPE MILLING MACHINE. 2 Heads on Rail; 2 Side Heads; Pendant Control; Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 3'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

6'x10 ga. DIAMOND Power Shear, 1952.

6'x13 ga. PARKER Power Shear, 1948.

#7A THOMAS open back Inclinable Press 80 Ton cap. Flywheel M. D. 1948.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared.

No. 6 FEDERAL O.B.I. Press, 65 tons cap. single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

T-56 VERSON Power Press Brake, 8' overall, late type. 100 Tons Cap. 1942.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder. Full Equipment. 1943.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

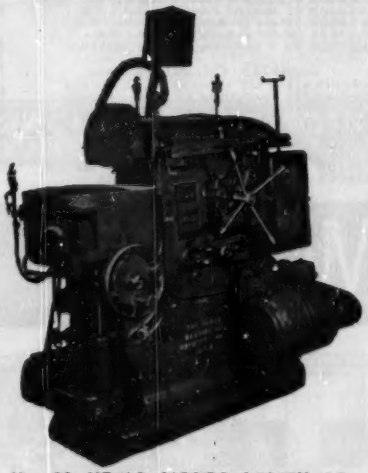
No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

12" x 24" GALLMEYER & LIVINGSTON Horizontal Hydraulic Surface Grinder.

No. 4H Landis Cyl. Hydraulic Grinder. 5"x12" Cap. Late Type. 1944.

No. 14 WD HAMMOND DOUBLE End Carbide Grinder, late type. 1950.

No. 91A COVEL Universal Tool & Cut-Carbide Grinder, late type. 1950.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

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1000 LATE TYPE TOOLS IN STOCK

AUTOMATIC SCREW MACHINES
ACME GRIDLEY RS, 1⅝", 6-spindle; late type
ACME GRIDLEY RB, 1¾", 8-spindle; late type
CONOMATIC 1⅞", 8-spndle; M.D., late type
CLEVELAND 3¾" Model "A" Single spindle late
CLEVELAND 8", Model "A", single spindle; late
NEW BRITAIN GRIDLEY Model 065; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
NILES 8" bar; floor type; motor drive
HEALD 46B and 48A single end Borematic; M.D.
HEALD No. 40 double end Borematic; M.D.

BORING MILLS—Vertical
BULLARD 8", 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 54" spiral drive, M.D., late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI 1-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VG1-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap, 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Radial
AMERICAN 4' arm 11" col. "Hole Wizard", late type
AMERICAN 5' arm 11" col. "Hole Wizard", late type
AMERICAN 5' arm 13" col. "Hole Wizard", late type
CINCINNATI BICKFORD 3' arm 9" col. high speed

DRILLS—Manufacturing
BARNES #202 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
NATCO B-4-B "Hole Steel" 50 adj. slip spindles
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO C-5 and E-5 high speed, 10 adj. spindles

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; Internal cap. 72" diameter; late type
FELLOWS No. 6IA & 6I5A High Speed Gear Shaper
FELLOWS No. 8I2 High Speed Gear Shaper; late
FELLOWS No. 7A and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 4 Tester; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 12 Tool Sharpener; motor drive
GLEASON No. 13 Hyp. Cutter Sharpener; late
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late type
GLEASON No. 19 Gear Tester and Lapper; M.D.
GLEASON No 20 Spur Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 8"x18" Model ER Plain, "Filmatic"
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 14"x36" type DC plain hydr. with infeed; late
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" type "O" Plain; late type

GRINDERS, Surface
ABRASIVE #34, 8"x24" table; late type
HEALD #22 Rotary, 12" chuck; M.D., late type

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 Geared Head; late type
WARNER & SWASEY #3 and #5 Univ. ram type

LATHES, Engine & Mfg.
HENDEY 24"x36" centers; motor drive; late type
LeBLOND 42"x108" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
NILES 30"x50' bed, single and boring, "Time Saver"
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2 M.D. late type
CINCINNATI 1-16 Production; Timken; late type
KEARNEY & TRECKER 2H, 2HL, & 4H, M.D., late

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x30" #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x160" centers; late type

MILLING MACHINES, Universal
CINCINNATI 2MH Univ., motor drive, late type
CINCINNATI #3 Dial Type, Timken, M.D., late
KEARNEY & TRECKER #3K; Timken; late type
VAN NORMAN #22L, #26 and #36 ram type; late

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 6-B Vertical; Timken; late type
CINCINNATI #2 model ER Dial Type; Timken
CINCINNATI #3 Dial Type; High Speed, New 1952
KEARNEY & TRECKER #3H and #4H late type

PLANERS
GRAY 36"x36"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
LIBERTY 144"x76"x48" adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30"; 4 hds; PRT; DC; M.D.

PRESSES
BLISS #410A, 525-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late type
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS
ROCKFORD 24", hydraulic motor drive; late type.
CINCINNATI 16"; motor drive; hydraulic, late type
CINCINNATI 20"; motor drive; late type
GOULD & EBERHARDT 32"; High Speed; motor drive; late type
MOREY 9" Vertical; motor drive; late type

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ALEXANDER #2, 3-dim. Engraving NEW 1952
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity ⅞" x 16'; motor drive
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
MANVILLE No. 3 Bolt Head Trimmer, M.D.
MANVILLE 2C Screw Slotter, Motor Drive
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No. 2MA-6 Avey 24"—1 Spdl. Drill.
2 Spdl.—24" S.W.—No. 3 Avey
No. K60H Fox 16 Spdl. Multi Drill
No. 2-20" 2 Spdl. Leland-Gifford LMS Drill
No. 2MS Allen 3 Spdl. Drill, 24" swing

Gear Machines
11" Gleason Gear Generator
No. 12HS Gould & Eberhardt
No. 36-BM G. & E.—3 spdl. Rougher
615-A Fellows Gear Shaper
612-A Fellows Gear Shaper

Grinders
6"x18" Norton Type C Plain (1943)
10"x18" Norton Type C Plain Hyd. Cam Gdr.
10"x36" Norton Type C Grinder
10"x36" Norton Type C Cam Grinder
14"x48" Landis Type C Pl. Gdr.
16"-40" Gap x 120" Norton Pl.
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20"x192" Norton Type A Pl.
24"x264" Norton Gdr.
B-24—25" Chuck Arter Surf. Gdr.
No. 16-30" Blanchard Rotary Surface Gdr.
TG615 J & L Thread Gdr.
No. 214 Besly Double End Disc Gdr.
No. 2 Cinn. Centerless Grinder
No. 2—14"x30" Brown & Sharpe Univ. Gdr.

Internal Grinders
No. 5 Bryant Internal Grinder
No. 5B Bryant Internal Grinder
No. 16-28 Bryant Int. Grinder
No. 16-38 Bryant Int. Grinder
No. 24 L-36 Bryant Hyd. Int. Grinder
No. 16 A-28 Bryant Internal Grinder
No. 24-26 Bryant Int. Grinder
No. 24-36 Bryant Internal Grinder
No. 81 Heald Internal Centerless
72-A5 Heald Int. Gdr. (1942)

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No. 3AL Gisholt, Cross-Slide Turret
No. 3 Warner & Swasey Turret Bar Feed
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No. 12 Barber Coleman (3)
No. 12H Gould & Eberhardt universal
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GRINDERS, CYLINDRICAL
4"x18" Cincinnati pl. hyd., plunge cut, 1946
6"x36" Norton "C" hyd., 1942
10"x18" Norton types BA, A C, late models
10"x18" Cincinnati Ajmatic, type ER (2), 1941-1948
16"x36" Norton type C hydraulic (2), 1943
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
18"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
16"/48"x96" Landis gap type hydraulic, new 1941
No. 13 Brown & Sharpe universal tool, new 1942

GRINDERS, SURFACE
16A2 Blanchard rotary surface, serial 6046, 1948
6"x18" Norton vert. spdl, hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base
12"x48" Model 300 Hanchett vert. spdl. 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942.
72" No. 72 Hanchett rotary surface, 1946

INTERNAL GRINDERS
Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (3), 1942-1943
No. 49 Van Norman radius, 1945

LATHES, ENGINE
14"/28"x36" centers Smith-Drum, gap, 1945.
14"x42" Handey G.H., M.I.B., 1940
24"x14 ft. bed American G.H., Q.C.G., serial 44670
52"x30 ft. bed Niles Bement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET
17"x72" LeBlond Rapid production (5), 1946-1947
No. H5 Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
No. 2 Brown & Sharpe vertical
No. 2 Cincinnati Hi-Power plain horizontal
No. 4 Cincinnati Hi-power plain horizontal
No. 5 Cincinnati Hi-power plain horiz., vert. attach.
No. 2-16 Cincinnati production mill, late
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 3B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman pl. horiz., 1942.
54" Ingersoll 3 spdl rotary, 1940.
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
30"x21"x12 ft. Ingersoll fixed rail planer type mill
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300 ton No. 1039 Hamilton S.A., D.C.
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#4F KEARNEY & TRECKER Pl. Horiz. Mill
#1403 KEARNEY & TRECKER Mfg. Mill
#1407 KEARNEY & TRECKER Simplex Mill
#4-48 CINCINNATI Duplex Mill

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#1A WARNER & SWASEY Turret Lathe
#2A WARNER & SWASEY Turret Lathe
#2L GISHOLT Turret Lathe
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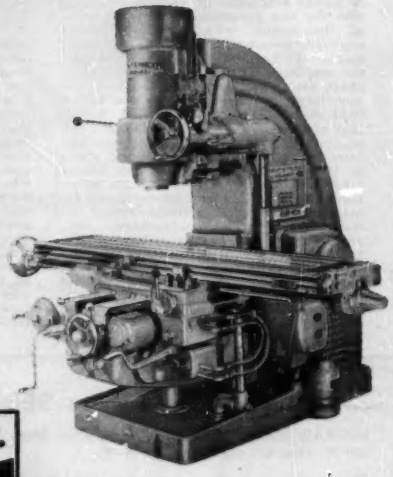

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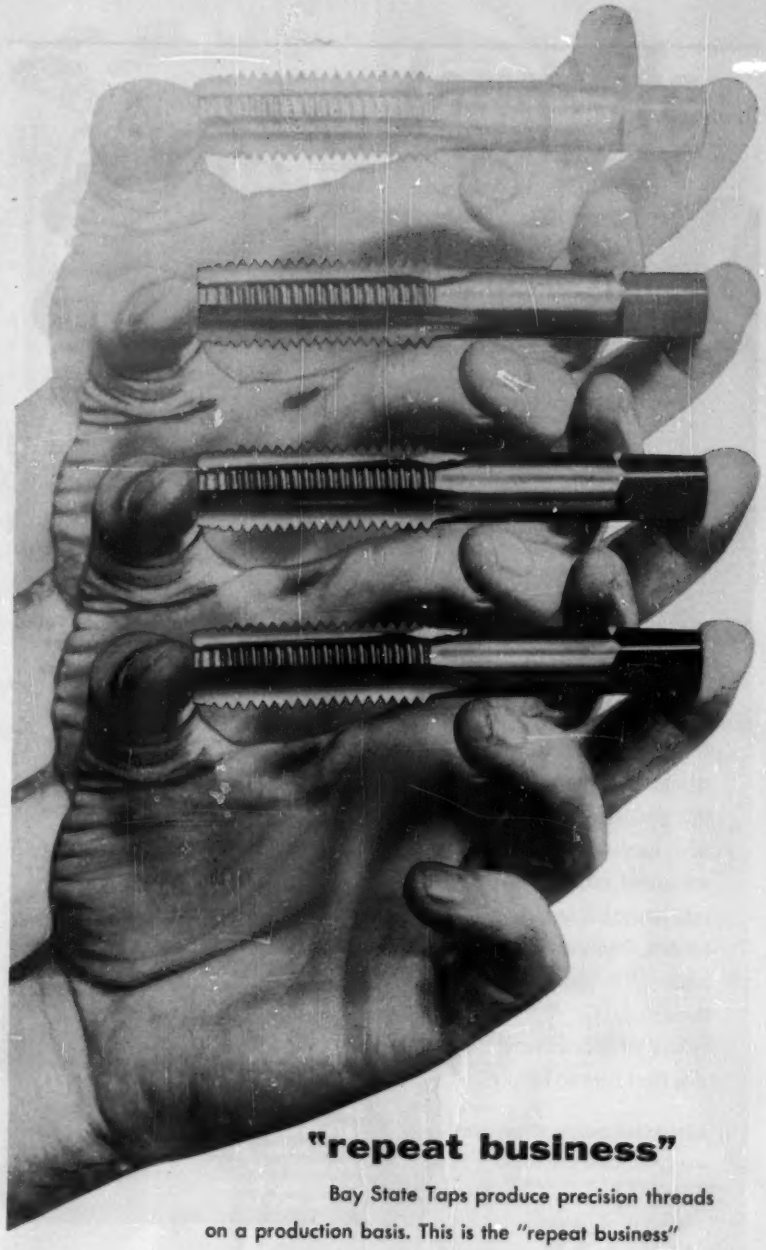

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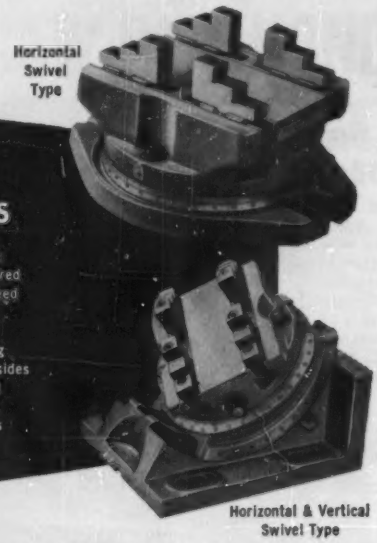

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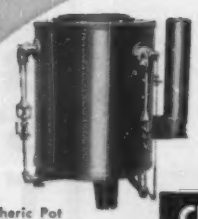

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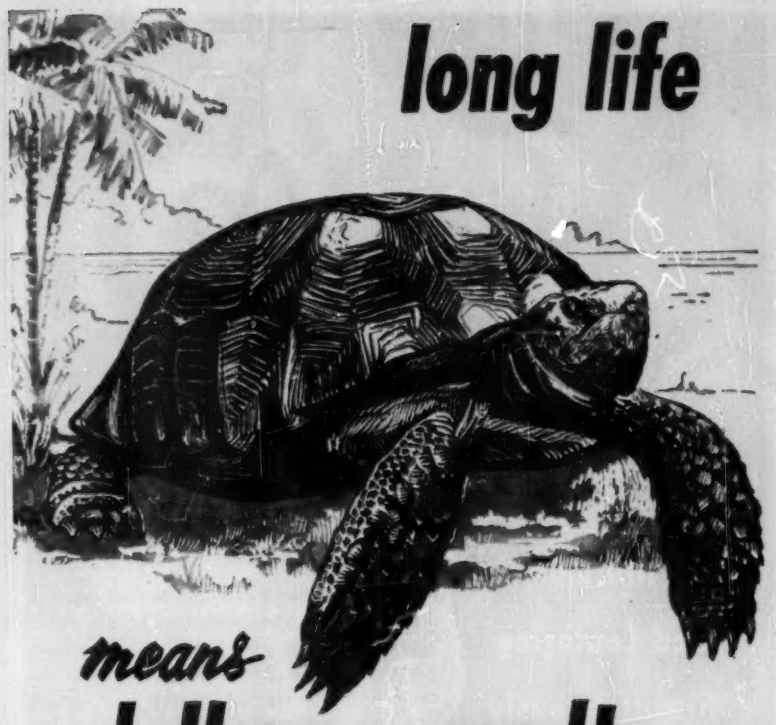

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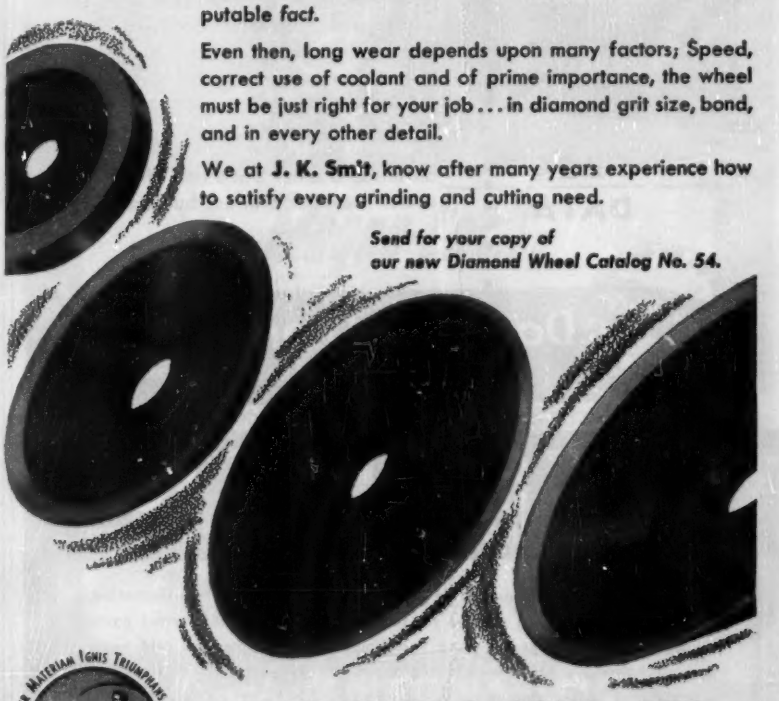

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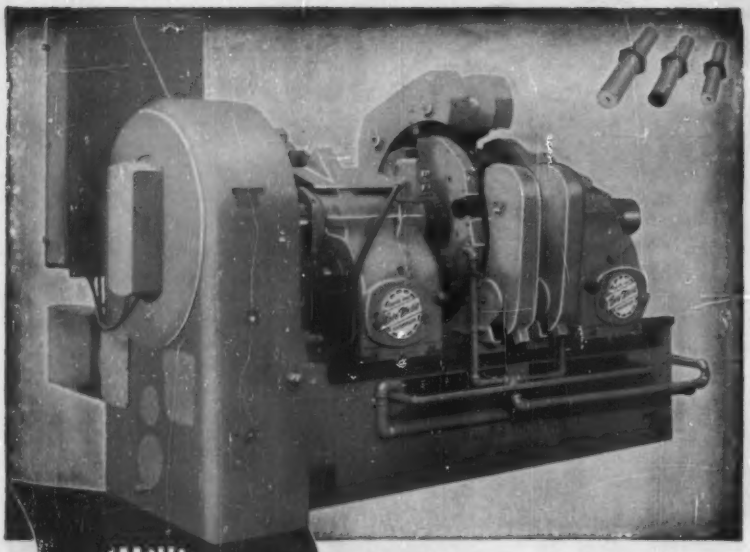

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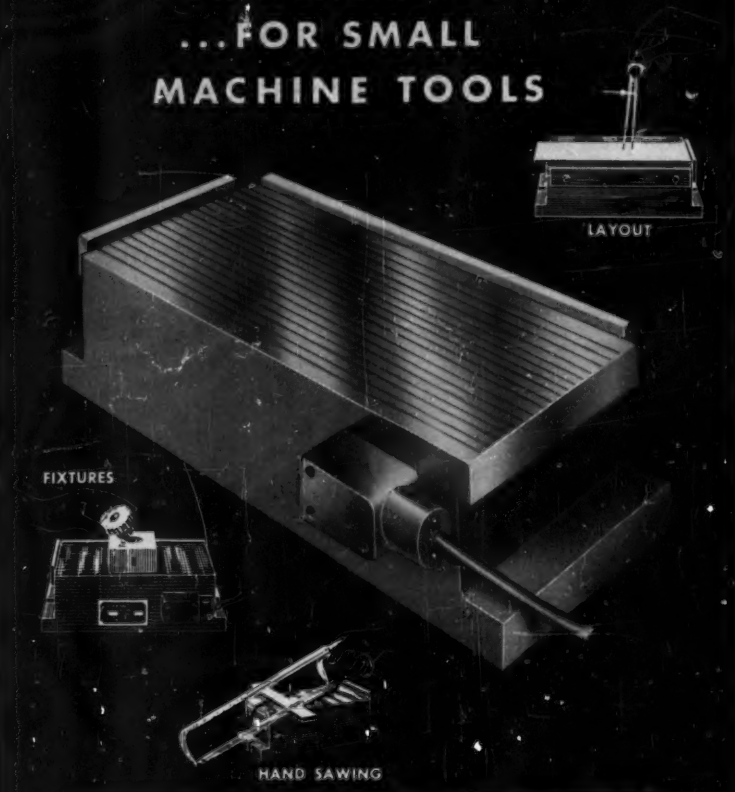

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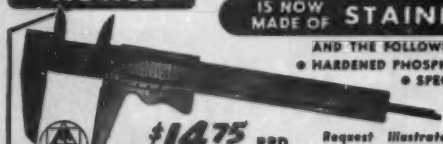

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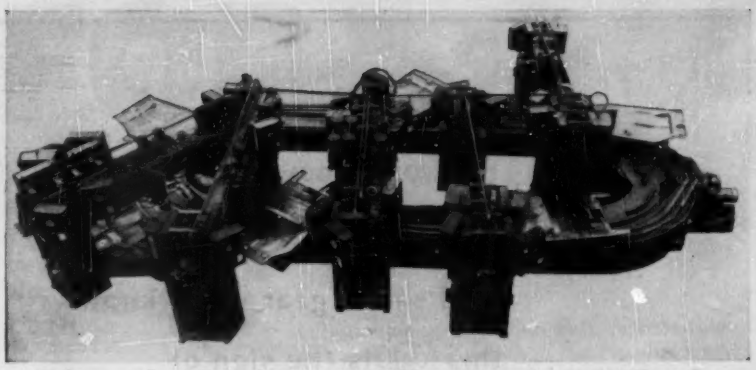

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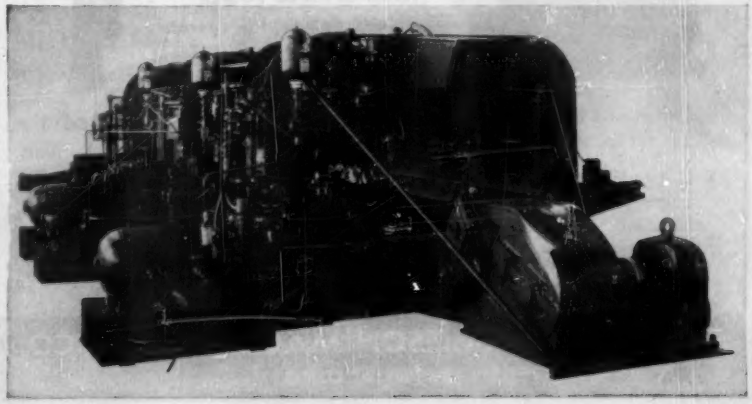

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the best in custom made gears.

May We Send You Our Brochure?

CINTI "Gears . . . Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO

C & J *Geared-Head* LATHES

16 INCH • 12 SPEED

A GENERAL SERVICE TOOL
FEATURING
HIGH SPINDLE POWER
Accurate—convenient to operate

- Clutch and brake control for spindle
- Exceptionally long carriage bearing — 23⅜ in.

Write TODAY for new bulletin 39-A-10.

ONLY ONE MODEL • ONLY ONE SIZE

- Feed provided by separate rod — lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

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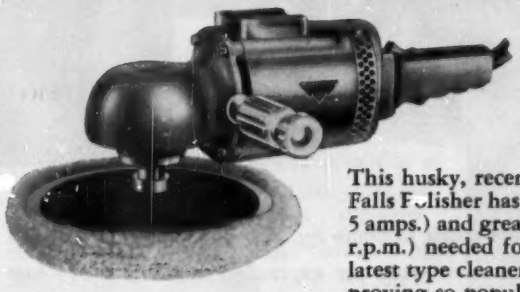
FOR

New, light-weight, heavy-duty No. 404

MILLERS FALLS GRINDERS

Latest addition to Millers Falls famous line of portable electric grinders, the No. 404 weighs only 9¼ lbs., yet has a 5.5 amp. rating. It uses 4" diameter wheels up to 1" wide and is designed for continuous heavy-duty service such as snagging castings, grinding welds, grinding off rivets, etc. Other models up to 6" with speed ranges from 3700 r.p.m. to 5500 r.p.m.

FASTER



High-speed, high-powered No. 270

MILLERS FALLS POLISHERS

This husky, recently-introduced Millers Falls Polisher has the extra power (a full 5 amps.) and greater spindle speed (1900 r.p.m.) needed for best results with the latest type cleaners and polishes that are proving so popular. It's light, compact, pleasant to use — and it's supplied with a deep, carpet-pile wool pad, the most effective polishing head ever developed.

FINISHING

MILLERS FALLS SANDERS

A beautifully engineered 7" unit, the 870 weighs only 7½ lbs., but carries a full 5.5 amp. rating and can handle continuous operation. Its no-load speed of 4500 r.p.m. makes it perfect for driving the new laminated phenolic grinding wheels and discs as well as for fast sanding. Other models available up to 9".

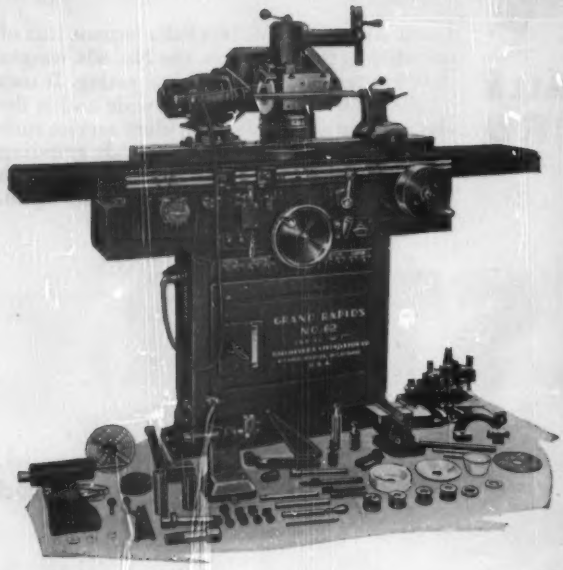
Light, high-power No. 870

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

FREE — Write for literature on Millers Falls wide line of portable electric grinders, polishers, sanders, drills, saws, screw drivers and other high-performance tools. Demonstrations gladly arranged on request.

MILLERS FALLS COMPANY, Dept. AM-2, Greenfield, Mass.

NOW! GRAND RAPIDS
UNIVERSAL CUTTER AND TOOL GRINDERS



are on improved delivery schedules

It's true, they have been hard to come by . . . every model offers so much extra value that even with our expanded facilities we're just now catching up to demand.

The model 62, for instance, features four-speed spindle drive with readily accessible motor and universal positioning of elevating hand wheel for unusual speed and convenience in set-ups. Fully guarded ball bearing ways eliminate friction in table travel. You get more vertical capacity and longer swing (12" plus). The two-speed headstock can be motor driven for cylindrical and internal grinding. The one-shot lubrication system reduces maintenance time.

GET THE FULL STORY ON ALL THE ADVANTAGES

There are many other Grand Rapids Universal Cutter and Tool Grinder models now with improved delivery schedules. For full information and specifications, mail coupon today to:

GALLMEYER & LIVINGSTON

GALLMEYER & LIVINGSTON CO.
430 Straight Ave., Grand Rapids, Mich.

Please send me the following literature without obligation:

- ☐ Grand Rapids Universal Cutter & Tool Grinder literature
- ☐ Grand Rapids Surface Grinder literature

NAME:

POSITION:

FIRM:

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We'll answer within twenty-four hours.

Here is the new, lightweight, swing-about pendant control on the Lucas horizontal boring machine. This flexible control places at the operator's finger tips, over the entire working area about the machine, START, STOP, JOG (forward and reverse) of the spindle rotation, and START, STOP, INCH and RAPID TRAVERSE of all unit motions.

Two smooth operating switch levers in this small-dimension pendant do the work of ten control buttons. The position of the levers gives quick visual indication of engagement and direction. One of many features that is keeping Lucas out in front among horizontal boring, drilling and milling machines.

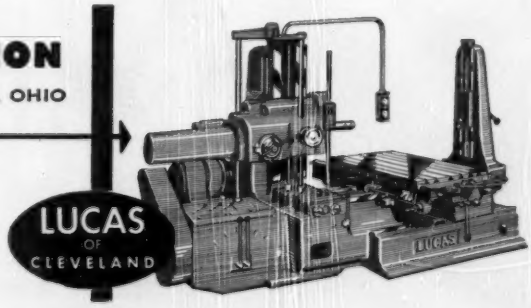
LUCAS MACHINE DIVISION

THE NEW BRITAIN MACHINE COMPANY • CLEVELAND 8, OHIO

. . . Machines for Making Progress

Lucas Horizontal Boring, Drilling and Milling Machines

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



Grinds breech of 4,000 lb. gun barrel

TIMKEN® bearings on work spindle hold runout within .0007"

THIS Bryant Internal Grinder does parallel and tapered grinding jobs —often to a depth of 48"—in the breech end of 4,000 pound gun barrels. To give high accuracy and stability under heavy loads, the huge work spindle is mounted on Timken® tapered roller bearings having a 24" bore and 32" O.D.

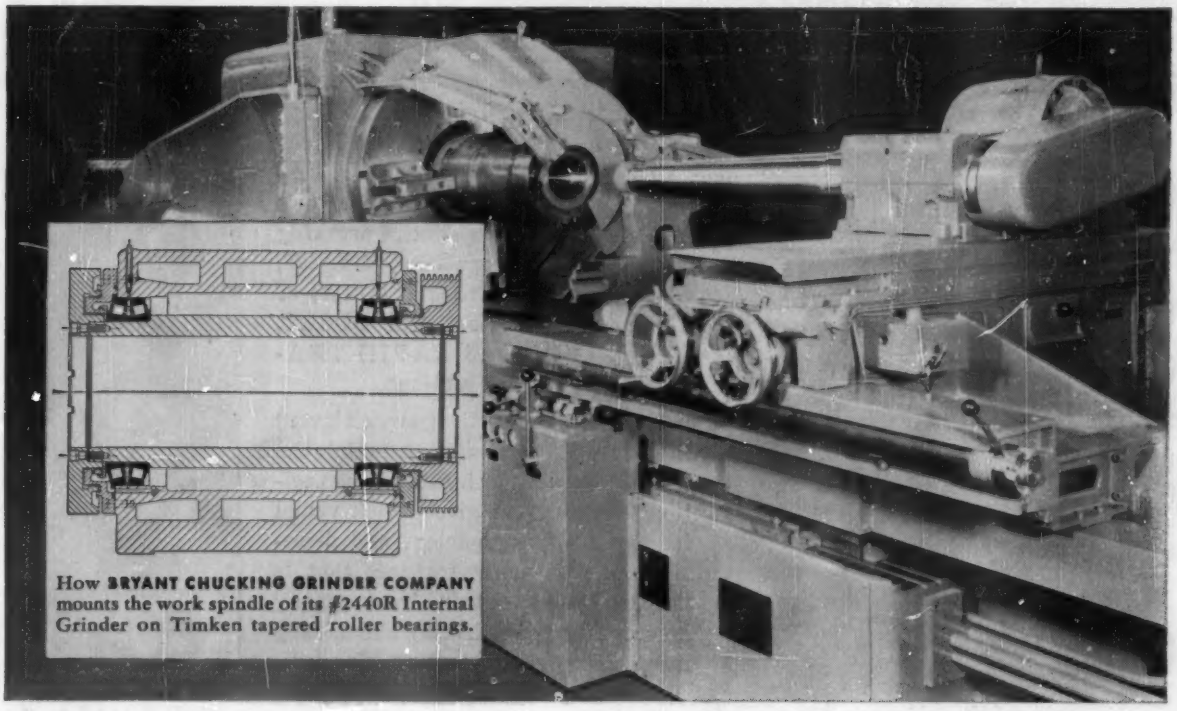
Due to their tapered construction, Timken bearings take radial and thrust loads in any combination. Spindles are held rigid, runout doesn't exceed .0007". And because of line contact between the rollers and races, Timken bearings have capacity to spare.

Both Timken bearings on the work spindle are mounted with cone spacers so that no manual adjustment is necessary. Spindle maintenance is simplified. And Timken bearings practically eliminate friction because they are geometrically designed to have true rolling motion and precision manufactured to live up to their design.

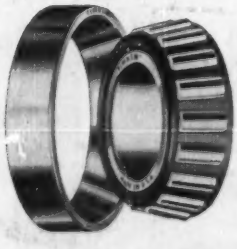
The end of the work spindle may possibly be bumped by the long, heavy gun tube when chucking a new piece. Timken bearings stand up to these shock loads because the rollers and races are case-hardened. This gives them hard, wear-resistant surfaces over tough, shock-resistant cores. What's more, we make our own steel to check quality every step of the way. No other U. S. bearing maker does.

Specify Timken bearings for the machinery you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **BRYANT CHUCKING GRINDER COMPANY** mounts the work spindle of its #2440R Internal Grinder on Timken tapered roller bearings.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

MAGNIFYING GLASS INSPECTION OF EVERY ROLLER!

Every one of the over one billion Timken bearing rollers produced every year is inspected with powerful magnifying glasses to detect surface flaws. It's just one example of how the Timken Company insures uniform high quality.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →○← LOADS OR ANY COMBINATION